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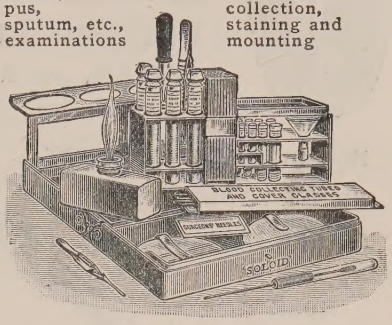

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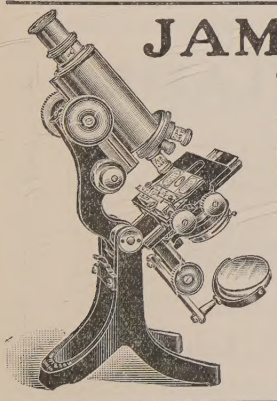

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TROPICAL DISEASES BUREAU.

TROPICAL DISEASES BULLETIN.

Vol. 2.] 1913. [No 9.

KALA AZAR.

India.

Donovan (C.). **Kala-Azar, its Distribution and the Probable Mode of Infection.**—*Proceedings of the Third Meeting of the General Malaria Committee held at Madras, Nov.* 18, 19 & 20, 1912. pp. 211-214; and *Indian Jl. Med Research.* 1913. July. Vol. 1. No. 1. pp. 177-184. With a map.

In this paper the author reviews the distribution of kala azar both in and outside India. It appears uncertain whether the disease occurs in Orissa or not. He then goes on to consider the probable modes of infection under two headings: (1) By means of insects, (2) by oral ingestion.

He considers that the bed bug theory of transmission has yet to be proved and that the *Conorrhinus rubrofasciatus*, suspected by him to be a transmitter, has not received such a fair trial of experiment as to justify its exclusion. Further, mosquitoes have been very little experimented with, in spite of the fact that kala azar and malaria exist side by side. As regards the flea and the possibility of its transmitting the disease from dog to man as it is supposed by some to do in Europe, the author points out that most extensive search has failed to reveal the canine disease in India even in the chief endemic centres of the disease. The author himself examined the spleen and liver of over 1,000 dogs in Madras in 1910, and Captain Patton has recently examined a still larger number with negative results.

The infection of a pup four months old after intrahepatic injection of $3\frac{1}{2}$ c.c. of spleen blood obtained from a case of kala azar is recorded. Two and half months after injection the dog was killed and parasites were found only in the bone marrow of the ribs while the liver and spleen were free. This fact renders it necessary to re-examine Madras dogs for the disease, since in previous examinations the bone marrow was only examined a few times. As regards the infection of the pup this is the first record of the experimental production of the disease in dogs. [Patton also records the infection of dogs.]

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As regards the possibility of oral infection the author notes that in a good percentage of cases of kala azar the illness commences with symptoms of intestinal involvement, and that in fatal cases ulceration of the gut is marked and leishmania occur in the tissues about the ulcers. It is suggested that possibly ankylostomes or even trichomonads might obtain parasites from the gut and transmit them.

C. M. Wenyon.

Patton (W. S.). **Is Kala Azar in Madras of Animal Origin?**—*Proceedings of the Third Meeting of the General Malaria Committee held at Madras, Nov.* 18, 19 & 20, 1912. pp. 215-220; and (in revised form) *Indian Jl. Med. Research.* 1913. July. Vol. 1. No. 1. pp. 185-195.

The author inoculated a series of animals (3 monkeys, 4 dogs, 2 jackals, 2 guinea pigs, 2 rabbits, 2 cats, 4 white rats, 1 goat, 1 pig, 1 calf) with comparatively large doses of emulsion of a very heavily infected spleen of a case of kala azar. The dose varied from 1 cc. in the case of the smaller animals to 4 cc. in the goat, 7 cc. in the pig and 9 cc. in the calf. All these animals were reinoculated fifteen days later with an emulsion made from another infected spleen. All three monkeys were infected, one dying after five weeks, another after six weeks, and the third killed six to seven weeks after the second inoculation. All the dogs were infected, the first dying 3½ months and the second four months after inoculation. In the first dog the liver, spleen, bone marrow and lymphatic glands contained many parasites while in the other dog there were *Piroplasma canis* as well as many leishmania. In films of the peripheral blood of this dog made a few hours before death both parasites were seen in polynuclear leucocytes. The author calls attention to the possibility of confusing phagocyted piroplasma with leishmania. The third dog remained healthy for nine months and then became ill and died ten days later. Four days before death *Piroplasma canis* and a few leishmania were found in the peripheral blood; the next day 500 leishmania were found in a single blood film and 48 hours before death as many as 1,000 parasites were found in a single film. After death smears from the organs contained many parasites. Dog No. 4 was caged next the one just described and it contracted *Piroplasma canis* about the same time. It was killed nine months after the original inoculation and smears of the spleen, liver and bone marrow showed many leishmania. Two days before death a few leishmania were found in the peripheral blood.

One of the jackals became emaciated nine months after inoculation and a few leishmania, as well as *Piroplasma canis*, were found in the peripheral blood four days before death. After death many leishmania were found in smears of the organs. One of the white rats died two hours after receiving the second inoculation. Numerous leishmania were found in the liver and spleen (see this *Bulletin*, Vol. 1, p. 3). None of the other animals became infected nor a further series of monkeys, dogs and rats which were inoculated with smaller doses of the virus.

In addition to the above experiments the author has examined

the spleens of 1,438 dogs destroyed in the lethal chamber in Madras from January 29 to November 25, 1912, and the spleens and bone marrows of 1,321 dogs from November 26, 1912 to May 16, 1913, without finding a single case of infection with leishmania. During the past seven years about 300 cats have also been examined with negative results. From the above results the author feels justified in concluding that the dog and probably the cat play no part in the transmission of kala azar in Madras.

C. M. W.

Patton (W. S.). **Further Observations on the Development of** *Herpetomonas donovani* **in** *Cimex rotundatus* **and** *Cimex lectularius.—Proceedings of the Third Meeting of the General Malaria Committee held at Madras, Nov.* 18, 19 & 20, 1912. pp. 221-232.

The author refers to his previous work (see this *Bulletin*, Vol. 1, pp. 1-3), in which he has shown that the parasite of kala azar will complete its development in the bed bug into the post-flagellate form if the insect abstains from a second feed of blood during the course of this development. Having a case of kala azar, in the peripheral blood of which numerous parasites occurred, a series of bugs was fed with the object of determining the temperature most suitable for this development. After feeding, the bugs were divided into batches and each batch kept at a different temperature. Seven bugs were kept at a temperature varying from an average minimum of 85° F. to an average maximum of 94° F. In these the parasites flagellated but instead of multiplying died out in about five days. Some more bugs (number not stated) were fed on the case and kept at the same temperature as the others. Before dissection they were fed on a rat. When dissected nothing was found in them. Six bugs and some others [number not stated] were fed and then kept at a temperature varying from 75° F. to 80° F. In four of these dissected after 39, 42, 46 and 96 hours respectively flagellates were found. In one dissected after 96 hours a few degenerating parasites were seen and in two dissected after 96 and 149 hours no flagellates were found. Others dissected after 5, 6, or 7 days were negative. Though the parasites will flagellate at this temperature then they quickly die out. A series of 39 bugs were kept at a temperature of 73° F.–75° F. In these bugs also flagellation occurred, but the parasites appeared to die out after four or five days. Two bugs kept at a temperature of 55° F.–65° F. and dissected after 93 and 96 hours revealed only partly digested blood and parasites either free or in unaltered leucocytes. Another 24 bugs kept under the same conditions were dissected from the fifth to the tenth day. They contained unchanged parasites, developing forms and in each a few flagellates. The low temperature had evidently retarded development. Unchanged parasites were seen in some bugs kept at the low temperature after the twelfth and thirteenth days. Apparently none of the above temperatures are suitable for a complete development of the flagellate and

prove to the author that the temperature limit for this development is a very narrow one. In his previous experiments (see this *Bulletin*, Vol. 1, p. 1) the author kept the bugs at a temperature of 71° F.–75° F. and in these a complete development to post flagellate forms occurred. This necessary range of temperature is to be found in Madras during the months of December and January and it is then that the parasite taken up from the peripheral blood by the bug is able to pass on through the flagellate to the post flagellate stage, provided that the bug does not have a second feed of blood before the post-flagellate stage is reached.

Apart from experimental work the paper contains some observations on the occurrence of parasites in the peripheral blood of kala azar cases. The case used for the experiments on one occasion showed as many as 1,043 parasites in a single blood film. This was four days before death. It was found post-mortem that in addition to a solid pneumonic lung a large empyema was present on the anterior surface of the upper lobe. In other cases the onset of severe dysenteric symptoms is accompanied by an increase in the number of parasites in the circulation. In one case in which this was found it was noted that the right kidney was practically a bag of pus. In all these cases there was a marked leucocytosis and this reaction caused the parasites to multiply in the spleen and possibly elsewhere. On being freed from the large endothelial cells they were taken up by the leucocytes and appeared in the peripheral blood.

C. M. W.

Cragg (F. W.). **An Investigation into Kala-azar.**—*Ibid.* pp. 39-42.

The fact that the development of any blood parasite in its transmitting host only takes place in a limited number of those actually taking up parasites from the blood led the author to make the following investigations. He studied the behaviour of the gut of flies after they had taken a full meal of blood, with a view of discovering in this behaviour an explanation of the non-development of the parasite in so many instances in which apparently circumstances were quite favourable for such development. For this investigation large Tabanid flies were used. The flies were given a full meal of blood and the guts, dissected out after varying intervals, were serially sectioned. The remarkable discovery was made that after the first feed of blood the whole of the epithelium lining the mid gut is thrown off into the lumen and as digestion proceeds a new epithelium is produced from nuclei which were previously lying between the columnar cells before desquamation had taken place. These changes do not occur in quite the same manner in flies which have a second or third feed of blood. This fact appears to the author to offer a possible explanation of the irregularity in development of any parasite in its transmitting host.

C. M. W.

Mackie (F. P.). **Progress Report on Kala Azar.**—*Ibid.* pp. 233-238.

The report refers mainly to investigations on kala azar in Kalna, Burdwan district, where Muir previously reported that he saw as many as six or seven hundred cases of kala azar in a week (*Indian Med. Gaz.* 1911. Feb., pp. 58-60 and *Kala Azar Bull.* 1912. No. 3. pp. 125-126). It was found that certainly four or five hundred cases of enlarged spleen passed through the dispensary each week. During two months 58 of these cases were suspected of kala azar and were subjected to spleen puncture with a positive result in 23 (39·6 per cent.). It was therefore evident that the great majority of unselected cases were not kala azar but probably malarial splenomegaly. An examination of 236 children in four schools in Kalna showed enlarged spleen in 23·2 per cent. None of the children could be suspected of having kala azar. Of the 23 cases diagnosed by spleen puncture none was under 10 years of age, 12 were between 10 and 20, 8 between 20 and 30, and 3 over 30. In pursuing such investigations in a country riddled with severe malaria the only safe criterion of kala azar is the discovery of leishmania, for the author has been deceived by clinical symptoms on several occasions. There could be found no special focus of the disease, which seemed to be scattered irregularly throughout the district without apparent reference to any climatic or geographical conditions. There was further no particular tendency to house infection. In many cases four or five apparently healthy persons were living in the same house with a proved kala azar patient. In Madras and Assam on the other hand house infection is said to be common.

As regards clinical symptoms and signs the author was much struck by the absence in the Kalna cases of some of the most marked features of the disease as ordinarily decribed. Amongst the 23 cases seen only three could be described as classical kala azar. In a good number of the Kalna cases the patients were fat and robust, bright and cheerful, and beyond enlarged spleens and irregular fever showed no signs of disease. Some of such cases showed large numbers of leishmania on spleen puncture. Recoveries are said to be frequent. It is possible that the disease is milder in Bengal than in Madras or that only advanced cases came into the Madras Hospital.

Examination of the peripheral blood has not been used as a diagnostic method as spleen puncture was available. It was carried out however in most of the severe and advanced cases, but parasites were found in two cases only and these in small numbers. The author had no difficulty in finding parasites in the peripheral blood of Madras cases, so does not consider the failure in Kalna as due to technique but rather to the greater chronicity and mildness of the disease in Bengal.

Experiments to ascertain whether bed bugs harbour the parasite of kala azar.—321 bugs taken from the beds and bedding of patients proved to be suffering from kala azar were dissected with negative result, while 70 laboratory-bred bugs were fed on

a patient in whose peripheral blood leishmania had been discovered (5-6 per slide). They were allowed to feed once and kept at ordinary air temperature. They were dissected from 1-30 days after feeding with the result that leishmania of the usual form were found in one or two on the day after feeding but not subsequently. Similar experiments with seven leeches were made with results so far negative. An examination of 22 bazaar dogs gave negative results as regards leishmania.

Animal inoculations were undertaken with the spleen juice of a boy who had died of kala azar. Thirteen white mice were inoculated. Only one became infected after intraperitoneal injection. It wasted and died seven days later and leishmania were found in smears of the spleen only. Two flying foxes were injected intraperitoneally. One of these died 16 days after inoculation, when an abscess was found in the abdominal wall. In the abscess pus some typical leishmania were found. The second flying fox was killed three weeks after inoculation. The only organs in which leishmania could be found were the pancreas and kidney. One large monkey received 10 cc. of spleen emulsion by the mouth. Two months later the animal was killed but no leishmania were discovered. Two other monkeys were injected intraperitoneally with 5 cc. of emulsion. One was killed two months and ten days later with no result, while the other was found by liver puncture to harbour leishmania one month after inoculation. Two months after inoculation it still appeared quite healthy though the spleen was enlarged and palpable. Puncture of this organ revealed leishmania. Ten days later it was killed and fair numbers of parasites were found in the spleen, few in the liver and none in the bone marrow or any other organ. Seven white rats were inoculated with a negative result in each case.

C. M. W.

Korke (Vishnu T.). **Progress Report on "Some Observations on the Epidemiology of Kala Azar in Madras."**—*Ibid.* pp. 239-256.

In Madras that part of the town known as Georgetown is the cradle of kala azar and during the last nine years the disease has not diffused evenly more than two miles in any direction from this centre. Cases from the outskirts of the city are exported from the centre, though Triplicane is an exception in that a small endemic centre exists here. The average number of persons living in each house in Georgetown is thirteen and this overcrowding together with defective hygiene is a very important fact in relation to the disease. In this district kala azar is purely *endemic* without any tendency to assume an *epidemic* form. Outside the city of Madras kala azar occurs in the Presidency, for the author saw two cases, one from Cuddalpore, the other from Madura, and met with another at Trichinopoly—a fakir from Malabar: suspected cases were also seen at Mandapan.

As regards seasonal incidence of the disease nothing definite could be determined, as the generally accepted view that all nationalities of all sexes and ages are affected was confirmed.

A detailed study of kala azar in its relation to the houses was undertaken, since it has been believed that houses themselves play an important part in the spread of the infection.

The result of this enquiry has been to establish the fact that unless case to case or contact infection has taken place further cases have not occurred in the houses. Thus, no case of the disease was found among the fresh tenants of 26 houses in which more than one case had occurred and in 300 houses in which only one case had occurred and of which the present inhabitants have never come in contact with a kala azar case.

In an examination of the cases with a view to determining the incubation period of the disease it was found that in some cases there was a minimum period of four months' incubation while in others it was much longer. From clinical and other observations it would appear, as Donovan and Patton have already pointed out, that there is a particular period in the course of the disease which is more infective than the rest.

C. M. W.

Young (T. C. McCombie). **An Account of an Investigation of the Prevalence of Endemic Kala Azar in the Plains of Assam.**—*Ibid.* pp. 257-265.

The epidemic of the 'eighties and 'nineties commenced in Goalpara and spread up the Brahmaputra Valley *via* the grand trunk road on the south bank of the river, through the sub-divisions of Dhubri and Goalpara to Kamrup. It then crossed to the north bank into Mangaldai and thence passed on to Nowgong in 1890. By 1896 the disease had reached the narrow tract of sparsely populated country which gives access to the more open, alluvial plains of the Golaghat sub-division and the Upper Brahmaputra Valley. Here stringent measures stayed the epidemic and the Upper Assam Valley was saved from its ravages. Subsequently the disease in its epidemic form declined and in 1901 it was considered that Goalpara and Kamrup were free from epidemic. Endemic foci however have been left behind and the present investigation indicates the position of these.

In the Golaghat sub-division of Sibsagar where the epidemic finally burnt itself out endemic centres still exist. This sub-division consists of 21 "mauzas" containing 629 villages, of which four hill mauzas were excluded from the survey and 396 villages were examined. In the Khumtai "mauzas" two villages have 23 infected houses while in the Maharani mauza two villages have nineteen infected houses. Four other villages also are infected. There is now accurate knowledge of the conditions in Golaghat and this is kept up to date by a Sub-assistant Surgeon. There is no cause for anxiety as to the present condition of affairs although the situation requires vigilance.

In Kamrup kala azar is prevalent in a village in the "thana" of Rangiya, in Sylhet a considerable number of deaths from the disease has been reported (1910), in Goalpara the disease was reported in the Dudnai thana (1911-12) and in Mangaldai the disease has recently been noted.

The author writes that the present situation appears to be this:—"that in an unknown number of areas in the Lower Brahmaputra Valley and throughout the Surma Valley there are still glowing points of slow combustion endemic foci. Furthermore in the Upper Assam Valley, which is the main centre of the important tea industry, there exists a population so far untouched by the endemic form of the disease, and hence presumably a rapidly combustible material for an epidemic fire, and that adjacent to this inflammable material there exists in Golaghat an area of combustion of not inconsiderable activity." At present the survey is continuing with a view to mapping out accurately all endemic foci so that the question of controlling and dealing with them in the future will be enormously simplified.

C. M. W.

Bose (Kailas Chandra, Rai Bahadur). **The Relation of Kala Azar to Malaria.**—*Ibid.* pp. 267-270.

It is often very difficult to separate the two diseases kala azar and malaria. A case which starts clinically as one of malaria with fever of the intermittent or tertian type may change its character and become one of kala azar with quotidian or continued fever. Apparently the author thinks it possible that at the time the fever takes the continued course the organisms of one class become replaced by organisms of the other so that quinine ceases to be of any avail. The author favours the treatment of these cases with measures calculated to produce a leucocytosis, for in his experience recoveries are by no means uncommon.

C. M. W.

Muir (E.). **The Diagnosis and Treatment of Chronic Malaria and Kala-Azar.** [Mirror.]—*Indian Med. Gaz.* 1913. July. Vol. 48. No. 7. pp. 267-268.

The author refers to his previous paper on the subject of kala azar in Kalna, Burdwan District (see *Kala Azar Bulletin*, No. 3, pp. 125-126), in which he advocated the treatment of the disease by the intramuscular injection of acid solutions of quinine with a view to producing a leucocytosis. Formerly, the author did not regularly diagnose the cases by the discovery of the parasite, but since the visit of Captain Mackie (see Report by Mackie, reviewed in this number) he has performed spleen puncture 150 times and is convinced that there is not the least danger attending this operation, at any rate in the cases in the Burdwan and Hooghly districts of Bengal in which the spleens are firmer than they appear to be in the Madras cases. A small needle must be used and only a drop or two of pulp and blood drawn up. In a few very acute and advanced cases the spleen is soft, but in these the parasites can usually be found in the peripheral blood. The injections of quinine described in the earlier paper continue to be of great benefit in cases of kala azar which are seen in time. The chief objection is that the injection is very painful for a few minutes if local anaesthetics are not used and this

is a difficulty in dispensary practice, in which one injects more than 100 patients in a day. Lately the author has injected another mixture consisting of:

Turpentine	1 drachm.
Camphor	1 ,,
Creosote	1 ,,
Sterilised olive oil	$2\frac{1}{2}$,,

The camphor and creosote are mixed first and the turpentine and oil added; 5-15 minims are injected into the muscles on both sides of the body, the latissimus dorsi or gluteus being most suitable. There is very little pain at the time, but later a certain amount of pain and swelling appears. Apparently the author uses this treatment in chronic malaria as well as kala azar, for he says that the reaction is much more marked in chronic malaria than kala azar in which larger doses have to be used to produce the same effect. In kala azar it is necessary to repeat the injections more frequently and to persist in them for a much longer time. In advanced kala azar these injections fail to cure though they may produce some temporary improvement. The onset of kala azar is usually with symptoms very like typhoid, with the exception that the tongue is not so coated and there is an absence of Widal's reaction. If these cases can be diagnosed at the onset or even in the first relapse the author believes that the majority can be cured by the above recommended treatment.

C. M. W.

Mediterranean.

Società Italliana fra i Cultori delle Malattie Esotiche. **Riunione Privata tenuta a Messina il 15 Giugno 1913 intorno alla Leishmaniosi Umana in Italia.** Atti, Relazioni, Comunicazioni Scientifiche (con tavole) per cura del Prof. Dr. G. Spagnolio, Dr. M. Signer, Segretari della Riunione.—180 pp. With 5 plates and 4 maps. 1913. Messina: Stab. Tipografico Guerriera. [Kala Azar. pp. 17-152.]

i. Scordo (F.). **L'Etiologia della Leishmaniosi interna nel Bacino Mediterraneo.** pp. 17-49.

This paper is a very interesting summary of the present state of our knowledge of Mediterranean kala azar.

ii. Di Cristina. **Sulla Sindrome, Diagnosi, Prognosi e Cura dell' Anemia da Leishmania** (Leishmaniosi interna). pp. 50-63.

Like the preceding paper this is a review of results already published.

iii. Gabbi (U.), Pellegrino (P. L.), & Montoro (G.). **Inchiesta intorno al Kala-azar nelle Provincie della Sicilia Orientale e della Calabria Inf.** pp. 63-77: also *Malaria e Malat. d. Paesi Caldi.* 1913. June-July. Vol. 4. No. 4. pp. 239-253.

The authors discuss in detail the distribution and incidence of kala azar in Sicily and Italy. As far as can be determined

from statistics it is shown that about 60-70 children die of the disease each year in Messina and the surrounding villages with a population of about 128,000. In Catania about 100 are infected each year while in Palermo 92 cases have been encountered in three years, so that each year in the three cities of Messina, Catania and Palermo with their villages about 200 children die of kala azar. There remain in Sicily the towns of Syracuse, Trapani, Girgenti and Caltanissetta, which have not been thoroughly investigated though isolated cases have been encountered in the last three. As regards the neighbouring coast of Italy there is still greater uncertainty. La Cava finds four or five cases each year in Bovalino with a population of 5,000 so that he estimates that in the whole of the Reggio Calabria district with a population of 200,000 the yearly incidence of the disease may be placed at 100. Extending these results to the coast of Tirrena and Jonica di Catanzaro with Lecce and the surrounding coast and adding the cases at Naples, Salerno and Caserta it comes about that in the provinces of Messina, Catania, Palermo, Girgenti, Trapani, Caltanissetta, Reggio Calabria, Cantanzaro, Lecce, Napoli, Caserta and Rome the number of cases each year must be put down at about one thousand.

iv. Dionisi (A.). **Contributo alla Anatomia Patologica dell'Anemia da Leishmania.** pp. 78-81: also *Malaria e Malat. d. Paesi Caldi.* 1913. June-July. Vol. 4. No. 4. pp. 265-269.

The author describes the changes in the various organs and the distribution of the leishmania in the body. The changes are attributed partly to the anemia and partly to the parasitic infection. The parasites may be found in any organ in the endothelial cells of the blood capillaries, in the cells of the stroma of the lymphatic and blood forming organs, in the cells of the spleen pulp and sometimes in the renal epithelium and more especially in that of the loops of Henle. The author concludes that the histological changes are very variable so that diagnosis from these alone may be exceedingly difficult.

v. Cannata (S.). **Il Sangue nell'Anemia da Leishmania.** pp. 82-88.

This paper is a resumé of work previously published by the author and others, and has been already noted in the *Kala Azar Bulletin* and this *Bulletin*.

vi. Cannata (S.). **Sul Reperto del Parassita di Leishman nel Sangue Periferico.** pp. 89-92: also *Malaria e Malat. d. Paesi Caldi.* 1913. Aug.-Sept. Vol. 4. No. 5. pp. 303-306.

This paper together with a previous note in *Pathologica*, 1913, June 15, and a paper in *La Riforma Medica*, 1913, August 2, deals with the demonstration of leishmania in the peripheral blood of cases of Mediterranean kala azar. Readers are reminded that in India and the Sudan parasites have been found in the peripheral blood of cases of the disease while in the Mediterranean districts Nicolle alone has succeeded in demonstrating the parasite in the peripheral blood of two of his cases. The author

of the papers now under review has been successful in finding parasites in the peripheral blood in seven out of eight cases of infantile kala azar. The ages of the children examined varied from one to three years and the duration of the illness from twenty days to one year so that apparently parasites are present in the circulation at all stages of the disease.

Various methods of centrifugation were tried without success as it was found impossible to obtain satisfactory films showing clear and unaltered leucocytes. Accordingly ordinary thin quickly dried blood films were used and 20 to 30 were prepared from each case. A mechanical stage was used for the search which the author admits to be very tedious and to require much patience. In one case one slide showed a large mononuclear cell and a polynuclear with one parasite each, while another slide contained a large mononuclear with one parasite. In all the other cases only a single cell, either a mononuclear or polynuclear, containing one or two parasites was found.

vii. Caronia (G.). **L'Anafilassi nella Leishmaniosi Infantile.** pp. 92-98: also *Pathologica.* 1913. July 15. Vol. 5. No. 113. pp. 420-423.

The fact that Di Cristina has expressed the view that the fever in infantile kala azar was due to anaphylactic phenomena led the author to investigate the anaphylactic properties of the blood in cases of this disease. To this end two methods of investigation were followed. In the first attempts were made to immunise guinea-pigs by injection of living cultures of leishmania till the animals ceased to react thermally to these injections. When in this condition 1-2 cc. of blood serum from a case of kala azar was injected into the animal intravenously. The animals reacted only by showing a slight fall of temperature and mild tremors of short duration. Accordingly the second method was adopted. This consisted of the intravenous injection of guinea-pigs with mixtures of 2-3 cc. of blood serum of a case of kala azar and 1-2 cc. of culture of leishmania on NNN medium. By this method much more definite results were obtained. Eight cases of kala azar were tested and in every instance the animals reacted definitely by showing tremors, dyspnoea, paralysis of the sphincters and a fall of temperature. This was followed by collapse and in those cases in which the largest dose was used (3 cc. serum with 2 cc. culture) death resulted. Four control experiments were undertaken wherein either healthy children or those suffering from other diseases were employed. In none of these was any such striking result obtained so that the author concludes: —

1. That the blood serum of children suffering from kala azar contains special substances capable of producing *in vitro* anaphylactic phenomena.

2. That all the symptoms shown by children suffering from this disease, especially the fever and the cachexia, are referable to such phenomena.

3. That this reaction may be used as a means of diagnosis when spleen puncture has been negative, as is the case sometimes in the last stages of the disease.

viii. Caronia (G.). **Sul Potere Complementare del Siero di Sangue nella Leishmaniosi Infantile.** pp. 98-102: also *Malaria e Malat. d. Paesi Caldi.* 1913. Aug.-Sept. Vol. 4. No. 5. pp. 309-313; and *Pediatria.* 1913. Aug. 31. Vol. 21. No. 8. pp. 583-587.

The investigations here recorded were conducted in the following manner. With all aseptic precautions a sufficient quantity of blood was drawn off from the finger of children suffering from kala azar. Healthy children were used as controls. The serum was allowed to separate and was then distributed in each case in a series of tubes, the first tube of the series receiving 0·01 cc. serum and the last 0·15 cc. The liquid in each tube was then made up to 1 cc. by the addition of physiological saline. To each tube was then added 1 cc. of a 5 per cent. solution of washed ox blood corpuscles together with 0·1 cc. of antibovine haemolysin of strength 1 : 1000. The contents of the tubes were then mixed and incubated at 37° C. for one hour. They were then examined and of those tubes showing complete haemolysis the one was selected to which the least quantity of original serum had been added. This quantity was taken to represent the complement power of the blood of the case of kala azar. In all sixteen cases were thus examined. The ages varied from eleven months to three years and eight months and the duration of the disease from twenty days to sixteen months. The highest value obtained was 0·07 and the lowest 0·03 with an average of approximately 0·04. In seven controls in healthy children the values were much higher, averaging 0·12. The author concludes that the complement power of the blood is increased in cases of kala azar and is more marked in the later stages of the disease.

ix. Spagnolio (G.). **Sulla Ganglio-puntura nella Diagnosi di *Leishmaniosi*.** pp. 102-104: also *Malaria e Malat. d. Paesi Caldi.* 1913. Aug.-Sept. Vol. 4. No. 5. pp. 306-308.

Many observers have noted that the lymphatic glands are enlarged in cases of infantile kala azar and Cochran in China has advocated the excision of the superficial cervical glands as a means of diagnosis in this disease. The author has examined two cases by puncture of lymphatic glands. In one of these a cervical gland and in the other an inguinal gland was punctured with the result that numerous leishmania were discovered in each case.

x. Scordo (F.). **Alterazioni Morfologiche dei Corpi del Leishman nei Kala Azar.** pp. 105-108: also *Malaria e Malat. d. Paesi Caldi.* 1913. Aug.-Sept. Vol. 4. No. 5. pp. 313-317.

The author notes that the parasites seen in smears of spleen material taken from certain severe cases of infantile kala azar have a peculiar degenerated appearance and that in some smears the non-nucleated fragments of leucocyte cytoplasm containing parasites are very numerous. He was led to think that should the degenerative process become more marked there might be a total disappearance of the leishmania, as apparently occurred in

a case recorded by Lignos (see this *Bulletin*, Vol. 1, p. 4) in which no parasites could be found at the autopsy through they had been shown by spleen puncture to be exceedingly numerous before death. According to the author this degeneration of the leishmania may take place in three ways. Firstly there is hypertrophy of the parasite followed by vacuolation of its cytoplasm; the nuclei increase in size, the kinetonucleus fragments, and finally after breaking up of the trophonucleus into small granules the parasite disintegrates. In the second method of degeneration the parasite becomes elongated and assumes the form of the flagellates seen in cultures on NNN medium though the flagellum is lacking; these become vacuolated and break up as before. Finally some of the parasites show a reduction of the cytoplasm, which eventually is reduced to a mere membrane enclosing the two nuclei. The author does not speculate as to the ultimate fate of these atrophic forms. The various degenerative processes are illustrated in a coloured plate. Figures are also given showing the detachment of portions of cytoplasm from large mononuclear cells containing parasites, giving rise to the bodies which have been described by various observers. The parasites may exhibit the degenerative changes while still enclosed in these portions of cytoplasm.

The author does not think that these degenerative phenomena are of rare occurrence and he is led to wonder if a periodic degeneration of parasites occurs during the course of the disease. He admits that these points can only be settled by further research.

xi. Ranieri (G.). **Il Primo Esempio di Leishmaniosi Interna a Campo Calabro.** pp. 108-109.

A case of kala azar in a child born in September, 1909, and the first to be recorded from Campo Calabro in Southern Italy.

xii. Licciardi (S.). **Sulla Leishmaniosi Interna in Catania.** pp. 110-115.

This paper is concerned with a case of recovery—the first to be recorded—of a child suffering from infantile kala azar, an account of which the author published in April, 1910. Since that time he has had a second case of recovery out of a total of 26 cases seen by him in Catania. He refers to cases recorded by Jemma, Nicolle, Spagnolio, Lignos, Caryophyllis, Sotiriades, and Petrone, bringing the total recorded cases of recovery to sixteen. [Some further cases of recovery are noted in the present number.]

xiii. Timpano (P.). **Un Caso di Leishmaniosi Interna finito con la Guarigione.** pp. 115-116.

The case recorded is one of an adolescent thirteen years of age, who suffered from irregular fever with large spleen, emaciation and marked anaemia. The case was thought to be one of malaria

but was treated without result with quinine. Spleen puncture was accordingly performed and leishmania discovered. The illness lasted three years and the case ultimately recovered, but the author is unable to say whether this was due to the treatment with quinine, arsenic and iron which had been carried out.

xiv. Spagnolio (G.). **Nuovi Casi Clinici a Nicotera Marino ed a Nizza Sicilia.** p. 117.

Two cases of kala azar are recorded—one from Nicotera Marino in Calabria and the other from Nizza in Sicily. They are the first instances of the disease noted from these towns.

xv. Vadalà (P.). **Il Primo Esempio di Kala Azar a Furnari dimostrato colla Spleno-puntura.** pp. 119-121.

Two cases of infantile kala azar, the first to be recorded from Furnari in Sicily, one of which was diagnosed by spleen puncture.

xvi. Spagnolio (G.). **La Cura Climatica nella Leishmaniosi interna.** pp. 121-123.

The main object of this paper is to record the result of the treatment of eight cases of infantile kala azar by removing them to healthy surroundings in a sanatorium about 900 metres above sea level. The treatment did not give encouraging results as there seemed a tendency for broncho-pneumonia and intestinal derangements to occur more frequently. Two other cases from Bordonaro, after treatment with atoxyl, appear to be on the way to recovery.

xvii. Abate (A.). **Contributo alla Casistica e allo Studio della Leishmaniosi Infantile.** pp. 123-126.

This paper is mainly a clinical study of 44 cases of infantile kala azar observed by the author in Catania. One interesting observation, which the author rightly considers to be unique, is the occurrence in one house of four children suffering from the disease. Diagnosis was made by spleen puncture in two of these only, but the author states that in the others the typical clinical picture could leave no room for doubt. Of the 44 cases only one can be regarded as having recovered.

xviii. Abate (A.). **La Resistenza dei Globuli Rossi nella Leishmaniosi Infantile.** pp. 126-127: also *Malaria e Malat. d. Paesi Caldi.* 1913. June-July. Vol. 4. No. 4. p. 263.

This is a preliminary note dealing with investigations into the resistance of the red blood corpuscles in twenty cases of infantile kala azar. The method employed was Cutore's modification of that of Viola. The results are not in accord with those of Cannata, for the author finds that the resistance is increased, especially as regards the maximum and minimum resistance.

xix. La Cava (F.). **Un Caso di Leishmaniosi Interna (Kala-azar) in una Giovinetta di 14 anni.** pp. 127-130: also *Malaria e Malat. d. Paesi Caldi.* 1913. Aug.-Sept. Vol. 4. No. 5. pp. 317-320.

A case of kala azar in a female child aged 14 years is described in detail.

xx. Pugliatti (G.). **Sulla Ricorrenza Primaverile della Leishmaniosi Interna.** pp. 130-133.

Four cases of infantile kala azar seen by the author appear to support the view that the disease commences between the months of February and June with a maximum number of cases in April and May.

xxi. Signer (M.). **Sulla Distribuzione della Leishmaniosi in Italia.** pp. 133-135: also *Malaria e Malat. d. Paesi Caldi.* 1913. Aug.-Sept. Vol. 4. No. 5. pp. 320-323.

The author considers the distribution of kala azar in Italy and Sicily and illustrates his remarks by two maps. He points out that the disease both in Italy and Sicily is found almost exclusively near the sea. This is true also of the whole Mediterranean district and suggests to the author that the disease is carried about by shipping and that with increased facilities of communication it will be likely to spread to inland towns.

xxii. Gabbi (U.). **Sulla Identità Clinica ed Etiologica della Leishmaniosi mana e Canina.** pp. 136-147. With 7 tables: also *Pathologica.* 1913. Sept. 15. Vol. 5. No. 117. pp. 543-552.

The paper is a lengthy study of the published experiments and observations dealing with the relations of human to canine kala azar. The author shows that according to results so far obtained there are marked differences between the spontaneous or naturally acquired kala azar of dogs and that artificially produced by inoculation of virus from cases of the human disease. In a table are set forth the differences in the symptoms of the disease in man and dogs; it is shown that many of the symptoms found in man are wanting in dogs and *vice versa.* Another section of the paper deals with the inoculations which have been done on different animals with the human virus, the cultural forms of this, the canine virus and its cultural forms. A series of very interesting tables is given showing the results of these various inoculation experiments, the animals used and the author making the experiments. As a result of the enquiry the author finds that there is no agreement between the results obtained with the different viruses as one would expect to be the case if they were identical. It is concluded that in the present state of our knowledge neither the symptoms nor the pathology lend colour to the view that human and canine kala azar are one, and that too many gaps exist in the experimental work to justify any definite assertions

and much less the establishment of any basis of prophylaxis. The various tables compiled, evidently with much trouble, from previous publications are of much interest to those engaged upon similar work but they are too long to be reproduced here.

xxiii. Spagnolio (G.). **Leishmaniosi Umana e Canina.—Studio d'Ambiente.** pp. 147-152.

In this paper the author contests the view that infantile kala azar is of canine origin and that fleas are responsible for the transmission of the malady. In Bordonaro, near Messina, during 1912 three cases of infantile kala azar were discovered and only in one case was a dog kept in the same house and it was quite healthy. Further, during last January, February, and April, Basile has discovered in this village five dogs infected though no case could be found amongst the children who had associated with these dogs. The author thinks that if infection comes from the dogs five heavily infected dogs should be sufficient to spread the disease broadcast amongst other dogs and children. This apparently has not been the case.

It has been claimed by many observers that infantile kala azar commences in the early months of the year, in spring, and Basile has stated that the statistics relating to the occurrence of canine kala azar indicate that dogs also contract the infection during this period, since the greatest number of dogs infected have been found in the months of June and July. To the author it seems clear that children become infected in January, February and March since most cases appear in March, April and May and this latter period corresponds to the period of incubation in dogs, so that it can hardly be assumed that children contract the disease from dogs. Further these periods should correspond to the greatest period of activity of fleas, which they do not, for fleas are most active in summer. It is pointed out that one cannot obtain good evidence of transmission of infection from one child to another, that the cases in adults are not in women who naturally harbour more fleas than men and who have been nursing infected children, that the occurrence of several cases at one time in the same family is not the rule, that there is no regular association of infected dogs with infected children, that if fleas were the transmitting agents the disease should be more wide-spread than it is, that in any locality the cases occurring in succession are not near one another but are far apart,—these are the chief arguments brought forward in this paper against the canine origin of infantile kala azar. [Perhaps the writer may state that in his opinion the knowledge of many of these subjects is as yet too incomplete to admit of conclusions being drawn, especially in reference to the periods of incubation in man and dogs, the susceptibility of dogs and children to infection and the percentage of the transmitting hosts (whatever this may be) which become infective even after taking up parasites. The disease in children and dogs may still be the same disease without it being necessary to prove that children must necessarily contract the disease from dogs. An infected dog would be a danger not only to children but to other

dogs as well, in just the same way as an infected child would be a danger to any susceptible dog or child with which it might come in contact].

C. M. W.

PITTALUGA (G.). **El Kala Azar Infantil (Esplenomegalia Parasitaria de los Ninos) en la Costa de Levante de España.**—*Rivista Clinica de Madrid.* 1912. Oct. 1. [7 pp.]

PITTALUGA (G.), del DIESTRO (J. García), & VILÁ (Manuel). **Estudios sobre el "Kala-azar infantil" y la "*Leishmania infantum*" en España.**—*Boletin del Instituto Nacional de Higiene de Alfonso XIII.* 1912. Dec. No. 32. pp. 17-45. With 3 plates.

These two papers have to do with the discovery of infantile kala azar in Spain. In the first of these it is shown that a disease which is undoubtedly kala azar has been long recognised on the Mediterranean coast of Spain. Thus in Perello, which has a population of about 2,000, since the year 1904 42 cases have been recorded under various names in children varying in age from a few months to three years, which, in the light of more recent research, should be regarded as infantile kala azar. In one case from Tortosa leishmania were discovered by spleen puncture, thus demonstrating that an endemic centre of the disease exists on the Levant coast of Spain.

In the second paper four further cases of this disease are described. The clinical manifestations are the same as those observed in cases from other parts of the Mediterranean and in three of the cases leishmania were discovered by spleen puncture. Cultures of the organism were obtained on NNN medium and these have been maintained through several sub-cultures. In connection with the preparation of this medium the authors point out that most of the rabbits employed are infected with *Trypanosoma cuniculi* and that its presence might lead to confusion with the cultural forms of the leishmania. In practice however the temperature of preparation of the medium usually kills off the trypanosomes, but where this does not occur it is easy to distinguish the trypanosomes from the leishmania.

Eight dogs from houses in which cases of splenomegaly occurred were examined with negative results. One hundred mosquitoes (Culex and Anopheles) were taken from a house in which a case of kala azar occurred and in one of these parasites resembling leishmania were found.

The bulk of the paper is occupied with a description of the cases, three of which are shown in photographs, and the leishmania obtained from them. Apart from the discovery of an endemic centre on the East Coast of Spain the paper contains little new information.

C. M. W.

Basile (Carlo). **I recenti Studi sull'Identità della Leishmaniosi Umana e Canina del Mediterraneo.**—*Policlinico.* Sez. pratica. 1913. July 20. Vol. 20. No. 29. pp. 1029-1032.

This paper is a review of recorded observations upon kala azar in the Mediterranean districts with the object of proving that the disease is the same whether in children or dogs. No new arguments in favour of identity are produced, but the author goes over the old ground and discusses the disease from the point of view of distribution, seasonal recurrence, symptomatology, therapeutics, parasitology and transmission. The author is convinced of the identity of the human and canine diseases.

In connection with the village of Bordonaro near Messina with a population of 2,000 the number of infantile cases found in the four years 1909-1912 has been 7, 1, 3, 3, and for the five years 1909-1913 the cases in dogs have been, 27 positive out of 33 examined, 4 out of 4, 5 out of 6, 7 out of 7 and 3 out of 3; so that from these figures the canine disease is still very prevalent there. It is pointed out that these examinations were made on dogs with clinical signs of the disease so cannot be taken as percentages of all dogs in the village.

C. M. W.

Tomaselli (A.). **Le Complicazioni della Leishmaniosi infantile.**—*Malaria e Malat. d. Paesi Caldi.* 1913. Apr.-May. Vol. 4. No. 3. pp. 180-181.

This paper gives a list of the various complications which have been noted by different Italian writers in kala azar in Italy. Apparently peritonitis resulting from perforation of the gut is the only complication of Indian kala azar which has not been noted in the Italian form of the disease. The paper contains no original matter.

C. M. W.

Quilichini. **Un Cas de Leishmaniose infantile suivi de Guérison. Formules Leucocytaires dans la Leishmaniose.**—*Bull. Soc. Path. Exot.* 1913. July. Vol. 6. No. 7. pp. 495-498. With 1 curve.

The present account refers to a case of infantile kala azar from Algiers, which was the subject of a former paper by the author in conjunction with the brothers Sergent and Lombard and was of especial interest in that a dog and cat living on the same premises were found to be infected also (see *Kala Azar Bulletin.* 1912. No. 3. p. 133). The author notes that during the early part of February 1912 the child's condition was so bad that they considered it had reached the final stage of its illness and that recovery was impossible. In spite of this active treatment was adopted with a most pleasing result. The child's weight being 8·5 kilos, an intramuscular injection of 0·08 cg. of hectine was given on the first day and repeated daily, the dose being increased each time by half a centigram till 0·10 cg. was reached. This dose was given for ten days. The fever was not appreciably affected by the treatment though the general glandular enlargement was

diminished and the spleen slightly reduced. In spite of a complete tolerance of the drug it was thought advisable to discontinue the injections of hectine for a few days. Accordingly daily injections of 1 cg. in 1 cubic centimeter of "*iodone injectable Robin*" were made. This had hardly any influence on the temperature, but the glands of the groin which were enlarged became completely reduced, while the spleen rapidly decreased till it was not more than three fingers' breadth below the costal margin though previously it had been enormously enlarged, extending to the iliac crest. After ten injections of iodine the hectine treatment was repeated for ten days. The spleen continued to diminish rapidly. This treatment of alternating injections of hectine and iodine was continued for three months, after which the fever disappeared completely, the spleen and liver assumed their normal proportions and the general health of the child improved rapidly, while its weight was increased by 2 kilos in one month. Though recovery now seemed assured, injections of hectine and iodine were continued for four months longer with increasing intervals between the injections. Fifteen months have now elapsed since the child ceased to have any clinical signs of the disease. The author thinks that the treatment adopted contributed largely to this remarkable recovery.

C. M. W.

Lignos (Antoine). **Deuxième Cas de Guérison de Kala Azar infantile observé à Hydra.**—*Bull. Soc. Path. Exot.* 1913. June. Vol. 6. No. 6. pp. 430-432. With 1 chart.

During the year 1910 six children suffering from kala azar came under the author's notice in Hydra. Of these five have died and one has recovered. During 1911 thirteen cases were encountered and of these eleven have died, one is alive (apparently uncured) and one has recovered. The first case of recovery was recorded in a former paper (see *Kala Azar Bulletin.* 1912. No. 3. pp. 132-133). A detailed account of the second case is now given. The child was eleven months old and was apparently in perfect health when it became suddenly ill on December 15th 1911. Leishmania were discovered by spleen puncture on January 28th, 1912. The child's condition fluctuated during the next six months and in August it was taken by its parents into the country. It was brought back in October free from fever and in a very satisfactory condition. Since that date all symptoms have disappeared and the spleen is no longer palpable. The recovery is attributed to the fact that the child was kept in the open air from August onwards.

C. M. W.

Caronia (G.). **Curve Termiche nella Leishmaniosi infantile.** [Temperature Curve in Infantile Leishmaniasis.]—*Pediatria.* 1913. July 31. Vol. 21. No. 7. (2a Serie, Vol. 11.) pp. 481-496. With 12 curves.

A detailed study of twelve cases of infantile kala azar is given with a view to discovering any particular features of the temperature curves in this disease. It is impossible to review this

paper here. The author's conclusion is that the temperature curve, from whatever point of view it is studied, has such special characters and is so distinct from all types of fever known that a careful and prolonged observation of it would place one in the way of a correct diagnosis before spleen puncture was adopted.

C. M. W.

Cannata (S.). **Inclusioni Leucocitarie nella Leishmaniosi Infantile.**—*Pathologica.* 1913. July 15. Vol. 5. No. 113. p. 420.

The author has noted that in cases of infantile kala azar the polynuclear leucocytes frequently contain granules of various shapes in their cytoplasm. They are either oval, coccoid, rod-shaped or in the form of slightly curved filaments and are either nuclear fragments phagocyted by the leucocytes or they may actually be remains of ingested leishmania. Similar inclusions have previously been described by Döhle in scarlatina and by others in a variety of pathological conditions.

C. M. W.

Laveran (A.) & Nicolle (C.). **Le Kala Azar Méditerranéen ou Infantile.**—*Trans. xvii Intern. Congress of Med. London.* 1913. Section xxi. Trop. Med. & Hygiene. Part 1. pp. 71-107.

This paper is a very excellent account of all the work that has been done on the subject of kala azar in the Mediterranean districts.

C. M. W.

Gabbi (U.). **On the Identity of Infantile and Donovan's Leishmania (Kala Azar).**—*Jl. Trop. Med. & Hyg.* 1913. July 1. Vol. 16. No. 13. pp. 198-199.

In this paper the author points out that the supposed differences, cultural and inoculative, between Indian and Mediterranean kala azar have been disproved by recent work.

C. M. W.

Gabbi (U.). **Sulla Storia del Kala-azar del Mediterraneo.**—*Malaria e Malat. Paesi Caldi.* 1913. Apr.-May. Vol. 4. No. 3. pp. 198-202.

This paper continues the discussion between the author and Laveran on the first discovery of kala azar and its parasite in the districts on the Mediterranean (see this *Bulletin*, Vol. 1, p. 633). The author points out also that in the review of a paper by Mazzitelli in Vol. 1 of this *Bulletin* it is not clearly stated that the first case of kala azar studied by the author (Gabbi) in Rome was one which had come from Messina. The author further regards as inexact the term "review" which was used in connection with his paper on the canine origin of kala azar summarised on page 632 of the same volume. He prefers to name his paper a "critical study."

C. M. W.

Caucasus and China.

Gurko (A. G.). **Vier Fälle von Kala-Azar.** [Four Cases of Kala Azar.]—*Zeitschr. f. Hyg. u. Infektionskr.* 1913. May 20. Vol. 74. No. 2. pp. 355-368. With 9 text-figs.

This paper deals with four cases of kala azar in the Caucasus district of south eastern Russia. The author states that only four cases have been so far recorded in Russia. Two of these were described by Nikiforow and Petrow and contracted the disease in middle Asia. The two remaining cases, noted by Marzinowsky and Kalatschnikow, were from Russia and Siberia (the governments of Mogilew and Tobolsk). In the Caucasus region though oriental sore is common no cases of kala azar have been recorded. In the course of five months the author has met with the four following cases diagnosed by spleen puncture:—

1. Armenian child of six and a half years of age of the town of Eriwan.
2. A boy aged six years and nine months in Tiflis. The disease probably was contracted in Baku or some other southern town. Both these cases were treated by intravenous injections of salvarsan with distinct signs of improvement.
3. A youth aged sixteen, a labourer of Eriwan.
4. A Mohamedan youth aged nineteen from the Elisabethpol district.

A fifth case in a Mohamedan girl of sixteen years was seen but no puncture was made. All these were typical cases of kala azar and offered no peculiar features.

As the paper was passing through the press the author met with five further cases.

C. M. W.

Hill (R. A. P.). **Note on a New Sign in Kala Azar.**—*Lancet.* 1913. Aug. 9. p. 392.

It is pointed out that a form of "splenic anemia" in children and occasionally in young adults has long been known in Pekin. The cases all came from villages outside the city and were first shown by Aspland to be kala azar. The author has seen eleven cases in the last two years, only one over fourteen years of age; this was a girl about 20 who had been ill for a long time. Besides these there have been three adult cases in the wards but they were all from South China, two from Fukien and one from Honan. The author has diagnosed the cases several times by spleen puncture, but has not been able to find parasites in the glands as done by Cochran. In Pekin the diagnosis of the disease is rarely difficult.

The sign referred to in the title is the peculiar behaviour of kala azar blood when mixed with a special diluent which the author has used in making leucocyte counts in blood. When the blood is diluted, instead of the red cells disappearing at once as they do in other diseases (typhoid fever, typhus, relapsing fever, ankylostomiasis, pernicious anaemia, benign tertian malaria, hepatic cirrhosis) they run together into great lumps, which can only be broken up by long and vigorous shaking—in fact it is

usually impossible to make a count at all by this method. This reaction has occurred in every one of eight consecutive cases. In one other case the reaction occurred and in this it was impossible to exclude kala azar.

The diluting fluid used is the following:—

A. Wright's modification of Leishman's stain, saturated and filtered ... ... 2 parts.
Pure methyl alcohol ... ... 1 part.
(This keeps indefinitely if well corked.)

B. 0·1 per cent. solution of pure sodium chloride in distilled water.

For use add 1 part of A to 3 parts of B, shake well and use within half an hour. If a precipitate forms or the cells overstain add a little more methyl alcohol to A. Dilute the blood 1 in 20 or 25 and mix promptly. If the mixing is done too slowly lumps may form in the blood, but in kala azar it is impossible with the utmost expedition to avoid lumping. In one case in which the reaction was least marked the case recovered under big doses of quinine.

C. M. W.

Kala Azar in Dogs.

Kohl-Yakimoff (Nina), Yakimoff (W. L.), & Schokhor (N. J.). **Leishmaniose Canine à Taschkent.**—*Bull. Soc. Path. Exot.* 1913. June. Vol. 6. No. 6. pp. 432-433.

The authors point out that oriental sore is a common disease in Turkestan and that the first case of infantile kala azar found in this district was described by Sluka and Zarfl in Vienna. After this discovery further cases were described by Marzinowsky in a child from Wolynsk, by Nikiforoff, from Tashkent, by Kalatschinikoff from Tobolsk and by Gourko in two infants and two adults from Tiflis.

In April 1913 the authors commenced an examination of the dogs of Tashkent. At the time of writing this paper they had examined 76 dogs, 22 of which were shown to be infected giving the very high percentage of 28·9 of dogs suffering from canine kala azar.

In the same month the authors saw a female child of nineteen months suffering from the disease.

C. M. W.

Laveran. **Présentation d'un Chien atteint de Leishmaniose et de Kératite.**—*Bull. Soc. Path. Exot.* 1913. July. Vol. 6. No. 7. pp. 447-478.

A dog was exhibited by the author to show an opacity of the left cornea which had developed on July 8th after an inoculation into the saphenous vein of a culture of leishmania of Indian kala azar on June 10th. It would appear from this corneal lesion that the dog was infected though the author had so far been unable to discover leishmania. This is the second time the author has noted corneal opacity as a sequel to inoculation with virus of kala azar. On a former occasion a dog was inoculated

(June 3rd, 1909) intrahepatically with the virus of Tunisian kala azar. The dog became infected and had developed almost entire corneal opacity of both eyes by April 1910. In this case leishmania were found in the liver and spleen. NICOLLE working in Tunis has noted similar lesions in dogs on two occasions. It is pointed out that protozoal infections (leishmania, trypanosome, toxoplasma) all tend to produce this corneal opacity in dogs.

C. M. W.

In Tehran, where oriental sore is very prevalent, Dr. A. R. NELIGAN* has discovered that the dogs suffer from ulcers about the face and that in these ulcers leishmania are often numerous. Examination of the internal organs of the dogs has not revealed a general infection, so that it would appear that the dogs were suffering from oriental sore, a disease which has not hitherto been found to occur naturally in these animals. This observation is of much interest in view of the fact that in the Mediterranean districts dogs may suffer from kala azar.

C. M. W.

TROPICAL SORE.

GONDER (Richard). **Experimentelle Übertragung von Orientbeule auf Mäuse.** [Experimental Transmission of Tropical Sore to Mice.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1913. June. Vol. 17. No. 12. pp. 397-403. With 2 plates.

The author has been able to infect mice both with *Leishmania infantum* and *L. tropica* by intraperitoneal and intravenous injections of the cultures in NNN medium. He points out that NICOLLE and his co-workers first showed that oriental sore could be produced in man, monkeys and dogs by the cutaneous inoculation either of virus from the sore or young cultures of *L. tropica.* LAVERAN has recently shown that old cultures of *L. tropica* will produce oriental sore in the monkey. Though there has been this success with the larger animals, and though infection of small laboratory animals has been produced by several workers by injection of cultures of *Leishmania infantum* of Mediterranean kala azar, no satisfactory infection of small animals has been produced by the injection of cultures of *Leishmania tropica.*

The materials used in these experiments were cultures of *Leishmania infantum* and *L. tropica* from Tunis. It was found, contrary to the generally accepted idea, that the cultures which contained a maximum of long flagellate forms produced infection better than old cultures which contained many round forms. To the liquid in each culture tube was added half to 1 cc. of physiological saline solution and 1 cc. of such mixture was injected into each mouse of 20 grams weight. It was noted that unless the saline was added the culture fluid frequently produced serious symptoms of toxic poisoning with dark red brown urine. The

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* *Jl. Trop. Med. & Hyg.* 1913. May 15. Vol. 16. No. 10. p. 156 [Annotation].

course of the infection could be followed by the operation of liver puncture which was very well tolerated by the mice. In both cases (*L. infantum* and *L. tropica*) a general infection was produced and the incubation periods were identical, enlargement of the liver and spleen being seen in about one month. In the case of *L. tropica* infection some of the mice ultimately, in several months, developed cutaneous ulcerations of varying severity. After intraperitoneal injection of cultures of *L. tropica* liver puncture revealed parasites in one mouse after one month, in two mice after two months and in other mice after three months. There was a morphological difference in the parasites first recovered from the liver. In the case of *L. tropica* the average size was 5-7 μ × 2-4 μ while the trophonucleus was irregular in shape and less compact in structure. With *L. infantum* the first parasites found in the liver had an average size of 1-3 μ × 1·5-4·5 μ. By the use of wet fixation in sublimate alcohol the author has been able to demonstrate in some parasites a short flagellum either representing the retraction of one already there or the commencement of the formation of a new one. He believes that by an intensive study of the parasites it would be possible to distinguish between them morphologically.

The great interest in this investigation lies in the results of the *L. tropica* infections. Internally, parasites only occurred in the liver and spleen, never in the bone marrow nor any other organ. The infected mice with enlarged liver and spleen appeared for some months to be quite healthy and undisturbed in any way by the leishmania. One mouse after four months became ill and died and enormous numbers of parasites were found in the greatly enlarged liver and spleen. Later another mouse died in a similar manner. Two other mice had no enlargement of the liver and spleen though these organs contained leishmania, so that in these animals the disease varies very much in its severity. In four other mice after a lapse of four months there developed oedematous swellings of the feet. Puncture of these produced a clear serous fluid which was practically a pure culture of *L. tropica* both free and included in leucocytes and lymphocytes. After some days the swellings commenced to necrose and similar lesions developed in the ears and tail and in one a necrosis of the lower jaw. In all these lesions *L. tropica* occurred. Two of these mice had a heavy infection of the liver and spleen till the peripheral lesions developed whereupon the parasites in the liver and spleen became very scanty. Another mouse which had extensive ulceration of the paws, tail and ears had parasites internally only in the liver. The fourth mouse, also with extensive ulceration had very large liver and spleen, in both of which as well as in the ulcers very numerous parasites occurred.

The author has been so far unable to produce infection by the cutaneous or subcutaneous injection of cultures of *L. tropica*. By the intraperitoneal and intravenous injection of material from the liver, spleen or ulcers of infected mice infection of the liver has been produced after an incubation of five to six weeks, though up to the present skin ulceration has not appeared.

In only one case has an oriental sore been produced, in the hind foot, by the subcutaneous injection of extracts of infected organs of mice.

The author naturally wonders whether the course of *L. tropica* infection in mice is not similar to that in man and suggests that possibly an infection of the liver and spleen occurs unrecognised before the cutaneous lesions develop. The long incubation period in man speaks in favour of this view.

C. M. W.

Società Italiana fra i Cultori della Malattie Esotiche. **Riunione Privata tenuta a Messina il 15 Giugno 1913 intorno alla Leishmaniosi Umana in Italia.** Atti, Relazioni, Comunicazioni Scientifiche (con tavole) per cura del Prof. Dr. G. Spagnolio, Dr. M. Signer, Segretari della Riunione.—180 pp. With 5 plates and 4 maps. 1913. Messina: Stab. Tipografico Guerriera. [Tropical Sore. pp. 153-170.]

i. La Cava (F.). **Sulla Frequenza, Diffusione e Sindrome della Leishmaniosi della Cute e delle Mucose (L. esterna) nell'Italia inferiore.** pp. 153-160.

This is an introductory address on the subject of tropical sore and reviews the present position of the subject. The disease is wide spread in the extreme south of Italy and Sicily, many cases having been now identified. Four cases of involvement of the mucosa of the mouth and nose have been recorded in Italy and Sicily—three by the author and one by Pulvirenti. A very interesting case came under the author's notice in which a child suffered from this disease and had a large spleen and fever while three other older children of the same family had been proved to suffer from infantile kala azar. Spleen puncture was performed on the child with the sore but no leishmania could be discovered, so that the fever and splenic enlargement remained unexplained unless it be assumed that the oriental sore had given a partial protection against the more serious disease.

ii. Pulvirenti (G.). **Anatomia Patologica, Diagnosi, Prognosi e Cura.** pp. 160-168.

A review of past work.

iii. Fazzari (G. B). **Un Caso di Bottone d'Oriente in Antonimina (Reggio Ca.).** pp. 169-170: also *Malaria e Malat. d. Paesi Caldi.* 1913. June-July. Vol. 4. No. 4. pp. 264-265. With 1 text-fig.

A case of oriental sore on the right side of the upper lip in a woman aged 38 years from Antonimina in Southern Italy. Diagnosis was made by discovery of numerous leishmania.

C. M. W.

Sant 'Anna (Firmino). **Trabalhos experimentaes sobre um Caso de Leishmaniase de Origem Brazileira.** [Experimental Researches on a Case of Leishmaniasis of Brazilian Origin.]—*Medicina Contemporanea.* 1913. Aug. 24. Vol. 31. No. 34. pp. 267-272. With 2 text-figs.

From a case of cutaneous leishmaniasis from the Upper Amazon the author has been able to infect monkeys. A Cercopithecus was inoculated with a saline emulsion of scrapings from the sore into the subcutaneous tissue in the supraorbital region and also by scarification on the skin of the forearm. Sixty-six days after inoculation a small ulcer was noted over the eye and leishmania in small numbers were discovered in the lesion. Five days later part of the lesion was excised for histological study and further inoculation. The lesion increased in size for two months till a large ulcer covering the supraorbital region was developed. The scarification on the arm did not lead to any appreciable result.

Another monkey (Cercopithecus), inoculated as the first, developed a small ulcer in the supraorbital region in which leishmania were found. This lesion only persisted for about one and a half months. The arm inoculation as in the first monkey produced no result. A third monkey was inoculated in the lower margin of the nares, with material from the excised sore of the first monkey. Nine days later there was a small excoriation covered with crust. This soon disappeared, but two months later there occurred at the same spot a nodule in which leishmania were found. A Cynocephalus was also inoculated with material obtained from the first monkey on the ears. Twenty-five days later there was a nodule at this spot. It increased in size and ulcerated. Smears contained many mononuclear cells as in the lesions on the other monkeys, but parasites were not discovered.

The greater part of the paper is occupied with a description of the leishmania and the histological study of the lesions.

C. M. W.

Boletim da Sociedade Brasileira de Dermatologia. 1912. Vol. 1. Nos. 1-2-3. 80 pp. With 10 plates. [Resumé in French. pp. 59-80.]

The publication under review contains an account of the proceedings of the Dermatological Society of Brazil. During the year several cases of leishmaniasis of the skin and mucosae were shown at the society's meetings. In some of these cases the disease was limited to the skin as in oriental sore, while in others there was extensive involvement of the nasal, pharyngeal and buccal mucosae producing the condition which has been previously described by Splendore and others (see this *Bulletin* Vol. 1, p. 11). In the discussions upon the case many of those present were familiar with the disease, which must have a fairly wide distribution in Brazil.

C. M. W.

Martoglio (F.). **Il Bottone Orientale in Abissinia.**—Extract from vol. "*In Onore del Prof. Angelo Celli nel 25 Anno di Insegnamento.*" 1912. pp. 411-419. With 1 text-fig. and 1 plate. [Rome: Tipografia Nazionale di G. Bertero.]

This paper contains a description of three cases of oriental sore from Abyssinia. A plate is given showing the typical leishmania found in the lesions. The author concludes that the disease is endemic in Abyssinia, including Eritrea. Though the diagnosis has not been made by spleen puncture the author believes that kala azar exists here also, especially in the provinces of Barentu and Agordal as it does in the neighbouring provinces of the Sudan.

This is the first time that oriental sore has been recorded from Abyssinia.

C. M. W.

Ufferte (L.) & Pellier (J.). **Sur un Cas de Bouton d'Orient (Clou de Gafsa).**—*Ann. de Dermatologie et Syphiligraphie.* 1913. June. Vol. 4. No. 6. pp. 331-334. With 1 text-fig.

One of the writers contracted oriental sore while on military duty in North Africa. He stayed in Gafsa for two days and during this time he wore no gloves and had many slight abrasions of the skin. Fifteen days later without any surrounding inflammation a wart began to develop on the back of each hand. Caustic applications were of no avail and only transformed the lesions into indolent ulcers. Eventually, seven months after their first development, leishmania were found. The authors believe that the disease was contracted at Gafsa, from which town the disease has received one of its names (*clou de Gafsa*).

C. M. W.

In the *Journal of Tropical Medicine & Hygiene** it is stated that Dr. Minett has found leishmania in the skin disease known as "forest yaws" in British Guiana. Flu has previously found leishmania in this disease in both French and Dutch Guiana [see *Kala Azar Bulletin* No. 2, pp. 108-109].

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* *Jl. Trop. Med. & Hygiene.* 1913. Aug. 1. Vol. 16. No. 15. p. 240 [Notes & News].

SLEEPING SICKNESS.

BERNARD. **Relation d'une Tournee Médicale faite dans la Region du Djema et du M'Bomou (Oubangui-Chari) Avril et Mai 1912.** —*Ann. d'Hyg. et Méd. Colon.* 1913. Apr.-May-June. Vol. 16. No. 2. pp. 321-332.

Sleeping Sickness was first recognised at Zémio in 1903 and its appearance corresponded with the erection of the factory at Djéma where it was brought by the company's labourers. From Djéma the disease has spread in all directions. This is a striking instance of the part played by infected human beings in the spread of the disease through their removal to distant parts.

The author writes that he cannot pass over in silence the part played by the native concubines of Europeans in the spread of sleeping sickness. He recognised trypanosomes in the glands of two of these women who had been brought from clean districts and who had without doubt been recently infected in the neighbourhood of the villages of the labourers and had thus become intermediaries for the transmission of the disease to the Europeans.

Among the clinical signs of the disease the authors lays stress on the alteration in the genital organs: impotence in the male, and amenorrhoea or dysmenorrhoea in the female. The signs are not constant, but they are extremely early and the same is the case with gastro-intestinal disturbances. The mortality from sleeping sickness in this region has been considerable.

A brief account is given of the various methods of prophylaxis which have been devised to deal with the disease.

W. Yorke.

BOURRET. **Recherches sur le Parasitisme Intestinal, la Dysenterie et la Maladie du Sommeil à Saint Louis Sénégal.**—*Ann. d'Hyg. et Méd. Colon.* 1913. Apr.-May-June. Vol. 16. No. 2. pp. 283-307.

The discovery of trypanosomes by direct examination of a drop of blood from sleeping sickness patients is rare in the Sénégal; the author only found trypanosomes in one case out of 45 and of these 20 were untreated. In the French Congo on the contrary MARTIN, LEBOEUF and ROUBAUD found trypanosomes in the blood of 36-45 per cent. of cases, whilst the English Commission to the Belgian Congo found the parasites in 13·6 per cent. of cases.

In view of the discovery of *T. rhodesiense* it was of interest to ascertain whether the human trypanosome of Sénégal was really *T. gambiense*. On examination this proved to be the case; no posterior nuclear varieties were encountered. The pathogenicity of the parasite was then examined. A guinea-pig died 6 months after inoculation; in rats the incubation period was 12-14 days and the duration 89-185 days; one single mouse died on the 35th day of the disease. A horse showed trypanosomes in its blood for the first time 46 days after inoculation. Its blood was not virulent for *Cercopithecus patas* 7 months after inoculation, but it had not acquired immunity, for 4½ months after a second inoculation of the Sénégal virus its blood was infective for monkeys and the animal had become emaciated. A sheep

had febrile attacks and showed signs of weakness a month after inoculation, although trypanosomes were never seen in its blood for a year; nevertheless at the end of this time it was infective for monkeys. A month after a second inoculation trypanosomes were found in its blood. The animal died 15 months after the first inoculation. Another sheep inoculated in Paris has never shown parasites in its blood nor has it presented signs of disease. Its blood, however, was virulent for white rats and its serum was protective not only against the Sénégal virus, but also against *T. gambiense*. In 17 *Cercopithecus patas* the incubation period varied from 9-35 days. As a rule, the animals did not live more than six months.

The Wassermann reaction in sleeping sickness.—Not having at his disposal any satisfactory extract of syphilitic liver, the author used as antigen an alcohol extract of normal human heart. As a result of his observations Bourret comes to the conclusion that the Wassermann reaction as carried out by him with non-specific antigen and the serum of sleeping sickness patients is too inconstant, at least in the second stage of the disease, to be of any value as a means of diagnosis.

Treatment of sleeping sickness.

(1.) *Atoxyl-orpiment.*—These drugs were administered as recommended by Thiroux: two series of 20 days of treatment separated by a period of rest of 8 days, each series comprising 5 hypodermic injections of atoxyl (·5 gm.-·75 gm.) at 4 day intervals and the daily administration of pills of orpiment (commencing at ·3 gm. and increasing each day by ·1 gm. to 1·1 gm. in those cases which tolerate the latter dose). As a rule this treatment was well borne. All the patients thus treated were in the second stage; none were cured, but in almost all the condition was ameliorated. The results in 12 patients so treated are given in a table.

(2.) *Atoxyl-emetic.*—Two periods of treatment separated by an interval of a month, each comprising 3 subcutaneous injections of atoxyl (·5 gm., ·75 gm. and 1·2 gm. or ·5 gm., 1 gm. and 1·5 gm. according to the weight), and afterwards from the 5th to the 15th day 10 daily injections of emetic in doses varying from ·09 gm. to ·15 gm. according to the weight. The results of treating 6 patients by this method are given in a table; they are very similar to those obtained by the previous method.

(3.) *Arsenobenzol.*—This drug has been used in 4 cases. It was always given intravenously. The injections in the first 3 cases were ·55 gm. to ·6 gm. at intervals of a month, in the 4th case the dose was ·5 gm. at intervals of 8 days and 4 doses were given instead of 2 or 3 as in the previous cases; the treatment was well borne. The results which are given in a table are not very satisfactory.

In conclusion the author writes that from the comparatively few cases treated it would not seem that arsenobenzol ought to displace the earlier remedies in the therapy of sleeping sickness. The atoxyl emetic combination appeared to give the best results.

W. Y.

Lurz (R.). **Ein Mittel von L. Brieger und M. Krause zur Behandlung der Trypanosomen im menschlichen Organismus.** [A Remedy of L. Brieger and M. Krause for the Treatment of Human Trypanosomiasis.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1913. Sept. Vol. 17. No. 18. pp. 636-640.

This paper records the results in German East Africa of treating a number of sleeping sickness patients with the remedy of Brieger and Krause. The following summary is given:—

Doses of ·25 gm. of the drug given after food [in cachet] twice daily resulted in all ten cases in severe diarrhoea, so that the patients became emaciated and subsequently refused to take the drug. Trypanosomes were found in the blood of all the patients on the 14th day of treatment.

When given as follows the drug was tolerated by six patients:—·1 gm. in the first week, twice as much in the second and third weeks and three times as much in the fourth and fifth weeks and ·25 gm. in the sixth week. One patient became markedly emaciated during treatment. Trypanosomes were found in all the patients in the gland juice during and after treament and the condition was not ameliorated.

Seven other patients bore ·1 gm. in the first ten days, ·2 gm. on the next ten days and ·3 gm. on the following 22 days. In three female patients the general condition became so bad that atoxyl treatment had to be resorted to. In one case the glands diminished in size and the trypanosomes disappeared from the gland juice, but not from the blood. The condition of the remaining patients was not altered.

In conclusion the author writes that this drug, either in large or small doses, is valueless for the treatment of human trypanosomiasis.

W. Y.

Morgenroth (J.) & Tugendreich (J.). **Aethylhydrocuprein und Salicylsäure als Adjuvantien des Salvarsan.** — *Berlin. Klin. Wochenschr.* 1913. No. 26. 16 pp.

The gist of this paper has been published previously (see this *Bulletin*, Vol. 2, p. 248). Details of the results of treating mice infected with nagana with these drugs alone and in combination are given in thirteen tables.

W. Y.

Recamier. **Un Cas de Trypanosomiase observé chez un Tirailleur indigène à Fort-Lamy.**—*Ann. d'Hyg. et Méd. Colon.* 1913. Apr.-May-June. Vol. 16. No. 2. pp. 442-443.

A clinical account is given of a case of sleeping sickness in a native trooper from Fort-Lamy. There is nothing noteworthy to record. Quinine had no influence on the temperature and the case ended fatally.

W. Y.

Transmission Experiments.

Kleine (F. K.) & Fischer (W.). **Schlafkrankheit und Tsetsefliegen. *(ii. Mitteilung.)** [Sleeping Sickness and Tsetse Flies.]—*Zeitschr. f. Hyg. u. Infektionskr.* 1913. Aug. 27. Vol. 75. No. 2. pp. 375-382.

Sleeping sickness due to *T. gambiense* is limited in East Africa to the localities in which *G. palpalis* occurs. In their earlier

* The first portion was summarised in this *Bulletin*. Vol. I. p. 270.

papers the authors left undecided the question as to whether this fact depended on climatic conditions or whether it was because this particular tsetse was the most suitable host of the infection. The practical application of this question lies in the fact that, if temperature and humidity be determinative, similar climatic conditions are equally likely to play a part in those regions where *G. palpalis* does not exist, but only the widely spread *G. morsitans;* if, however, *G. palpalis* itself is the chief factor, the infection will be limited to the distribution of this fly.

In order to decide this point a series of closely parallel experiments were undertaken with laboratory bred *G. palpalis* and *G. morsitans* in the neighbourhood of the Rutschugi station about six hours north of the great caravan route between Tabora and Ujiji. The climate was hot in the daytime and cold at nights, and was thus quite different from that of sleeping sickness districts. The investigations were undertaken in the rainy season.

Thirteen experiments were performed and in each a different strain of *T. gambiense* was used, monkeys (*Cercopithecus rufoviridis*) being infected from various sleeping sickness patients. Laboratory bred flies of both species were fed on the infected monkeys at the same time, or one immediately after the other, on each of four days, and then as usual on healthy animals. When one of the monkeys became ill the flies living were divided into small groups and these were fed on different animals. In this way a rough idea of the number of infective flies was obtained. After feeding each group the surviving flies were killed and examined. Details are given of the thirteen experiments and the results are set forth in two tables. Of 881 *G. palpalis* only 8 became infective, whilst developmental forms were found in 15 others which died or were killed after the 12th day of the experiment. The developmental period of the trypanosome in the fly was 28 to 30 days. In regions the climate of which is favourable to the development of the trypanosome, that is in sleeping sickness districts, 2·5 to 6 per cent. of the *G. palpalis* became infective after an interval of only 20 to 25 days.

Of the 881 *G. morsitans* fourteen became infective and developmental forms were observed in 40 others which died or were killed after the 12th day of the experiment; the developmental period was 37 to 42 days, which is thus on average 10 days longer than the corresponding period in the case of *G. palpalis*.

As a result of these experiments it appears that the connection of sleeping sickness and *G. palpalis* is dependent not on the specificity of the tsetse, but on the climatic conditions obtaining on the lake shores, which are peculiarly favourable to the development of the trypanosome. Furthermore, it seems that *G. morsitans* might transmit *T. gambiense* in places,—*e.g.* the highlands,—which have hitherto been considered safe from the infection.

Incidentally it might be remarked that it is known that in spite of suitable external conditions the infection very frequently does not spread. In these cases the trypanosomes have apparently lost their capacity for development in Glossina. The reason for this is not clear, but as a matter of fact the authors have noted

strains of trypanosomes with which it is impossible—or possible only with great difficulty—to render Glossina infective.

[This paper should be compared with those of KINGHORN and YORKE on the influence of climatic conditions on the development of *T. rhodesiense* in *G. morsitans* (see this *Bulletin*, Vol. 1, p. 43 and 126).]

W. Y.

WILD ANIMALS AND SLEEPING SICKNESS.

AUSTEN (E. E.). **The Present Position of the Problem of Big Game, Tsetse Flies, and Sleeping Sickness.**—*Jl. Soc. for Preservation of Wild Fauna of the Empire.* 1913. Vol. 6. pp. 57-71.

The first portion of this paper summarises our knowledge of the relation of sleeping sickness to tsetse flies and big game, whilst the latter portion is a reply to the arguments developed by YORKE in lectures before the Zoological Society and elsewhere on the relationship of the African fauna to the spread of sleeping sickness.

With reference to the experiment advocated by YORKE (see this *Bulletin*, Vol. 2, p. 238) the author writes "Suffice it to say that the suggested experiment is devised on scientific lines, and that, provided it be possible to ensure the elimination of all contingencies by which the results might conceivably be vitiated, no valid objection can be urged against its being carried into effect."

The possibility of there being other 'Reservoirs' of *T. rhodesiense* than big game is considered. Should this be found to be so the author is of opinion that the case against the game might be materially affected. On the other hand, should it be shown that the parasite sometimes occurs in the blood of certain small mammals without doing these animals any harm, big game might still be by far the more important reservoir, since, owing to the great disparity in size of the animals, the total mass of living antelope blood in any area must usually be much greater than the total mass of living small mammal blood within the same limits.

There is yet another possibility, namely, that certain human beings may be reservoirs of the parasite. The possibility of the existence of human reservoirs in the case of *T. gambiense* is admitted by some authorities. The author quotes a recent paper by TODD (see this *Bulletin*, Vol. 2, p. 255) in support of this view. Owing to the greater virulence of *T. rhodesiense* it must be admitted that at first sight it would seem less likely that human beings should be reservoirs of it than of the parasite just mentioned. KINGHORN and YORKE write, however, that "occasionally a patient is more resistant, and one native definitely proved to be infected with *T. rhodesiense* is still alive and in a state of apparent good health a year later." To what extent mankind is a reservoir of this parasite remains to be proved. It is possible that in districts infested by *G. morsitans* the ratio of human reservoirs to population is extremely high. According to KINGHORN and YORKE in North Eastern Rhodesia only about 1 tsetse fly in 500 (a percentage of 0·2) is naturally infective with *T. rhodesiense*. Evidence on this head with regard to Nyasaland is as yet very scanty, but, writing on June 7, 1912,

Sir David Bruce stated that he and his colleagues had found this particular parasite in 8 out of 38 experiments, amounting to a percentage of 21. This would appear to indicate a state of things much more serious than that which apparently obtains in North-Eastern Rhodesia; and, if anything like so high a percentage as 21 of wild *G. morsitans* in Nyasaland is naturally infected with *T. rhodesiense* (or *brucei*), it is difficult to understand the comparatively trifling incidence of sleeping sickness among the population of that country, as at present reported, except upon the assumption that the majority of the people are immune. [The author has made a remarkable mistake in stating that the Royal Society Commission found *T. rhodesiense* in 21 per cent. of wild *G. morsitans*. He has apparently overlooked the fact that in each of the 38 experiments performed by this Commission many flies were used. As a matter of fact, Bruce and his colleagues found that of 10,000 wild *Glossina morsitans* examined by them only ·2 per cent. were naturally infective—a figure which is identical with that of Kinghorn and Yorke. It is necessary to draw attention to this error, as it is apparently on the misconception that 21 per cent. of wild *G. morsitans* are infective that the author assumes "that the majority of the population are immune." Even assuming that a proportion—which must be small in view of the rapidity with which the great majority of the recognised cases of the disease have died—of human beings are tolerant of the trypanosome and serve as carriers for long periods of time, these form in the reviewer's judgment a quite insignificant reservoir of the virus compared with the antelope.]

W. Y.

Corydon (R. T.). **Tsetse Fly and Big Game.**—*Jl. Soc. for Preservation of Wild Fauna of the Empire.* 1913. Vol. 6. pp. 41-56.

In this article the connection between tsetse fly and big game is discussed at considerable length. In conclusion the author writes: "It is not denied that fly is generally found with game, and in fact often follows it, but only that slaughter of game should not be authorised till it is shown that by killing the game you will do away with nagana disease, not only with *Glossina morsitans*. I desire to make out a common-sense case against the petrified belief that fly is dependent upon game, and so to prevent, or at least to postpone, the slaughter, untried and certainly unconvicted, of many thousands of beautiful and valuable animals."

W. Y.

T. Brucei.

Fischer (W.). **Über das Vorkommen von Kernverlagerungen bei *Trypanosoma brucei*.** [On the Occurrence of Aberrant Nuclei in *Trypanosoma brucei*.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1913. Sept. Vol. 17. No. 18. pp. 621-626. With 16 text-figs. and 1 curve.

The author refers to the statement of Kinghorn and Yorke that 16 per cent. of the wild game of the Luangwa Valley were

infected with the human trypanosome. The correctness of these observations, however, appears doubtful, as KINGHORN and YORKE did not record the existence of *T. brucei* which is closely related to *T. rhodesiense.*

Trypanosome strains were examined in a sleeping sickness free area as regards forms exhibiting change of position of the nucleus, with the idea that *T. brucei* would also be found to show posterior nuclear forms. The work was undertaken at Malai, between Tabora and Ujiji, which is absolutely tsetse fly free. Wild *Glossina morsitans* were caught in the surrounding fly area and brought to the laboratory and fed on dogs. In this manner six separate strains, morphologically and biologically identical, were obtained. An account is given of the pathogenicity and morphology of the strains, which were found to be identical with those of the parasite which one was accustomed to regard as *T. brucei.* Recently it has been shown that the original *T. brucei* is monomorphic and not dimorphic. It is possible that this is due to long maintenance by passage through laboratory animals, but in any case the trypanosome which is found in Central Africa in *morsitans* regions and which possesses all the biological characters of *T. brucei* is of a definitely dimorphic type.

Forms exhibiting aberrant nuclei were most commonly met with in guinea-pigs (21·3 per cent.) and more rarely in dogs and monkeys (3·5 per cent.).

In addition to the above six strains posterior nuclear forms were found in a blood film from an infected mule. KLEINE observed posterior nuclear forms in preparations from animals infected with *T. brucei* on the east coast of Lake Victoria, and ECKARD in the blood of a rat inoculated from a bushbuck from Tanganyika.

A biometric curve constructed by measuring 100 trypanosomes on each of ten consecutive days of the infection in a monkey is given.

In the author's opinion it is not permissible to refer to the trypanosomes of game on account of certain morphological peculiarities as *T. rhodesiense.* He holds the same view as TAUTE (see this *Bulletin,* Vol. 2, p. 348) that the assumption of KINGHORN and YORKE that 16 per cent. of the game of the Luangwa Valley is infected with *T. rhodesiense* still requires proof. [The author has brought forward no evidence to show that *T. brucei* (Uganda) of BRUCE, or *T. ugandae* of STEPHENS and BLACKLOCK, is different from *T. rhodesiense.* It is highly probable that these parasites are identical.]

W. Y.

HECKENROTH (F.) & BLANCHARD (M.). **Réaction de Fixation, en Présence d'Antigène Syphilitique, dans la Syphilis, le Pian, la Trypanosomiase et l'Ulcère phagédénique au Congo français.**— *Compt. Rend. Acad. Sciences.* 1913. Sept. 1. Vol. 157. No. 9. pp. 437-440: and *Caducée.* 1913. Sept. 20. Vol. 13. No. 18. p. 244.

The method used was that devised by LEVADITI and LATAPIE, which is characterised by the employment of alcoholic extract

of the liver of a syphilitic foetus as antigen and the anti-sheep complement and amboceptor normally found in almost all human sera. This simplified method is valuable for use in the Colonies; the author found that such a haemolytic system is complete in the majority of sera and that it was only necessary to use guinea-pig complement and anti-sheep amboceptor of the rabbit in about 3 per cent. of cases.

Experiments on the fixation of complement were performed with the serum of 73 cases of trypanosomiasis, of which 4 showed well-marked lesions of syphilis. Deducting these cases the following results were noted:—Of 27 cases in good condition 15 gave a positive reaction (55 per cent.), and of 41 patients in bad condition 27 gave a positive reaction (65 per cent.). There is hence no doubt that syphilitic antigen can fix complement with trypanosomal amboceptor in more than half the cases whatever may be the state of the patient.

It was not possible to determine why the reaction was positive with the serum of certain patients only.

W. Y.

Rosenthal (Felix). **Untersuchungen über die Genese des Rezidivs bei der experimentellen Trypanosomeninfektion.** [Investigations on the Genesis of Relapses in Experimental Trypanosomiasis.] — *Zeitschr. f. Hyg. u. Infektionskr.* 1913. June 26. Vol. 74. No. 3. pp. 489-538.

The following summary is given:—

The experiments described show that the trypanocidal measure of a specific trypanosome immune serum does not represent the chief factor in the conversion of a normal strain into a relapse strain. It seems probable that besides the trypanocidal antibodies independent serum substances exist—called by the author relapse bodies—in response to which the trypanosomes are stimulated to the formation of receptors differing from those of the parent strain. The following observations support the view that relapse bodies exist as entities apart from trypanocidal immune bodies.

1. The dissonance between the trypanocidal power of trypanosome immune serum and its relapse strain formation power as observed *in vitro*.

2. The greater thermolability of the relapse strain formation bodies which are destroyed by heating to 60° C. for 15 minutes, whilst the trypanocidal antibodies remain intact.

3. The relapse strain formation properties of specific trypanosome immune sera appear to be bound in preference to the albumen fraction of the serum, whilst the trypanocidal bodies are found to be as much associated with the globulin as the albumin fraction.

According to the amount of trypanocidal substances and relapse bodies in immune sera the following possibilities were noted on treatment of normal trypanosomes in the test tube with sufficient but not lethal quantities of the immune serum.

1. The trypanosomes become relapse parasites without delay.

2. After more or less delay of the infection the surviving trypanosomes possess relapse strain properties.

3. The trypanosomes succeeded after a distinct or considerable time in developing again into normal parasites.

4. The trypanosomes may exhibit normal strain and relapse strain properties at the same time.

Acquired relapse strain properties need not be permanent. The return of the relapse strain to the original strain need not depend, however, on the return of all the parasites, but can be accomplished by the existence of true mutation forms due to the overgrowth of trypanosomes of the variation type which retrogress to the normal strain.

Biological distinctions exist between the relapse strain produced through contact with immune serum in the test tube and that resulting spontaneously in the course of infection. In the same way relapse strains, produced by the action *in vitro* of immune sera of different days, exhibit biological differences as tested by the immunity reaction.

Mice immune serum shows *in vitro* little or no trypanolytic capacity; on the other hand the blood of cured mice possesses *in vivo* strong trypanolytic action. This is in agreement with the absence of haemolytic complement in mouse serum, whilst *in vivo* complement is demonstrable.

W. Y.

Ravenna (Ettore). **Lesioni Endocardiche nella Tripanosomiasi Sperimentale.** [Endocardiac lesions in experimental trypanosomiasis.] — *Archivio per le Scienze Mediche.* 1913. July 10. Vol. 37. No. 3. pp. 236-249.

The author refers to a previous paper in which he published as a preliminary note some observations upon endocardiac lesions in dogs infected with trypanosomiasis. In the present paper he gives an account of further observations. The changes consist in the formation of small nodules of inflammatory nature on the valves, "miliariform endocarditis of Banti." No trypanosomes were found in such nodules in any of the dogs examined. In one group of dogs examined the endocardiac lesions were found in seven out of ten. A control did not show such changes. The author concludes that in experimental trypanosomiasis in the dog alterations of the endocardium are frequent.

W. Y.

PROTOZOOLOGY.

Laveran (A.) & Franchini (G.). **Infections expérimentales de la Souris par *Herpetomonas ctenocephali*.—*Compt. Rend. Acad. Sciences.*** 1913. Sept. 1. Vol. 157. No. 9. pp. 423-426.

The authors give a brief review of the work on the flagellates of cat and dog fleas by Patton, Marzocchi, Nöller and Fantham, and point out that the number of insects infected varies with the locality. They recall that the Herpetomonas possesses oval or rounded non-flagellate forms and flagellate stages, whose average body measurement is 10 μ with a flagellum about 8 μ.

Four white mice were inoculated intraperitoneally with gut contents of dog fleas containing herpetomonads. After 2, 3 and 4 days, parasites were found in the peritoneal exudate; in two, parasites occurred in the blood, the infection lasting 42 and 61 days respectively. A mouse subinoculated with peritoneal exudate showed parasites two days later, but the infection only lasted 48 hours. Another mouse, inoculated with blood showed parasites three days later, and infection lasted 52 days. In every case, parasites were rare or very rare. The parasites were usually spherical or oval. They are almost always free and the greater number are leishmania-like. Larger elements may occur in the spleen. Flagellate forms were very uncommon in the infected mice and occurred only in the blood.

The authors state that the parasites found in inoculated mice are very near to those of *H. ctenocephali*, the rarity of the flagellated elements constituting the chief difference. They also suggest that the parasite, if acclimatised to the new medium (mouse blood), might be able to become pathogenic, thus opening new ideas on the etiology of Leishmaniasis. The possible parasitic effects of *H. ctenocephali* must also be taken into account in attempts at transmitting kala azar by inoculating mice with contents of dog fleas.

A. Porter.

Wenyon (C. M.). **Observations on *Herpetomonas muscae domesticae* and some Allied Flagellates. With special Reference to the Structure of their Nuclei.—*Arch. f. Protistenkunde.*** 1913. Sept. 25. Vol. 31. No. 1. pp. 1-36. With 3 plates, 6 text-figs., and 1 diagram.

The author examined houseflies obtained in Aleppo, Syria, using wet fixation and iron haematoxylin staining. The majority of the Aleppo flies contained the large *Herpetomonas muscae domesticae*. Smaller leptomonas forms were also present and the author is "convinced that they are merely stages of the larger flagellate, for transition forms connecting the two types are common." Some trypaniform flagellates also were found. Other preparations showed that "*Herpetomonas muscae domesticae* (Prowazek's supposed biflagellate) likewise has a trypanosome stage." Thus "the *Leptomonas* of Roubaud and others is merely a not actively dividing *Herpetomonas muscae domesticae* and (that)

both may pass through a transition into flagellates of a trypanosome type." The types of production of "small, round forms" [post-flagellates] are described. (1) If derived from leptomonas forms, cysts of the usual type are produced. (2) If the flagellate is trypaniform, more of the flagellum remains intra-corporeal and the body itself becomes rounded after approximation of its ends. (3) The body "simply contracts to a globular shape." Nuclear multiplication may occur during encystment.

Further examination of the flagellates of the Aleppo housefly has strengthened the opinion of the author that the flagellate of the housefly is not biflagellate but "that the forms showing the two flagella were the result of the precocious formation of new flagella in anticipation of a coming longitudinal division." The division of the basal granule of the flagellum, the karyosome of the kinetonucleus and the division of the trophonucleus have been traced. The author believes that a cytosome and cytopharynx are present, using as an argument the presence of bipolar bodies which he believes are bacteria taken up by the Herpetomonas, which "renders the presence of a cytostome very probable."

The cytology of the trophonucleus is discussed in detail. "It is probable that the karyosome is built of three essential portions or substances. There is the chromatin material, the centriole, and finally a plastin material which binds the two former together." Full details of the division of the centriole are given, but it is clear that great variation in nuclear appearances results from the degree of abstraction of the stain. The division of the karyosome of the kineto-nucleus also is described. The basal granule is considered to function as a centrosome in nuclear division. The flagellum has an ectoplasmic sheath. In dividing forms it is considered that the flagellum of one daughter individual arises by the growth of a new rhizoplast near the old one. No axostyle structure of as definite a form as Prowazek describes could be found.

The author makes some statements regarding nomenclature. From what he has found among the flagellates of houseflies he believes that "there are four types which these [insect] flagellates may assume." It should be mentioned that stained preparations were used throughout. The four forms are designated Trypanosome, Crithidia, Leptomonas and Leishmania, and the author criticises the work of other authors on various Herpetomonads, as he considers their organisms have no trypanosome phase, which he has now put forward as essential to Herpetomonas. [But it must be remembered that information as to stages in the life cycle of any flagellate and the relation of intermediate forms can only be definitely decided by study of the living organism and actual watching of the processes of transition. Also, stained preparations alone cannot decide the question of mixed infections, which the above work has somewhat overlooked.]

The nuclear structure of certain other flagellates is briefly noted. The nucleus of *Trypanosoma rhodesiense* has a granule representing the centriole or the centriole together with chromatin. As previous workers have found, there are no definite

chromosomes in nuclear division. The author states that "Another feature brought out in [the] degeneration products of these trypanosomes is the structure of the flagellum," and he considers that in dividing forms the new flagellum arises *ab initio*, as in his *H. muscae domesticae*. [But can reliance be placed on features observed in admittedly degenerating forms, especially when stained material only is used?] *T. lewisi* was examined but little new found. Cultures of a Leptomonas from *Pulex irritans* on NNN medium gave many dividing forms, whose kinetonuclei are like those of the other flagellates. The author has the same ideas with regard to the origin of the daughter flagella as he has for *H. muscae domesticae*. A second description of *Cercomonas longicauda* is given. It is apparently the same organism as described by Hartmann and Chagas as *C. parva*, but they regard the second flagellum as passing through the body, Wenyon as passing over it, and the latter found neither axostyle nor rhizoplast as described by the German workers. Three plates illustrate the paper, but it is regretted that the magnification of the figures is not given.

A. P.

von Prowazek (S.). **Notiz zur *Herpetomonas*—Morphologie sowie Bemerkung zu der Arbeit von Wenyon.** [Note on *Herpetomonas*—Morphology and Remarks on Wenyon's Paper.]—*Arch. f. Protistenkunde*. 1913. Sept. 25. Vol. 31. No. 1. pp. 37-38.

The author wishes to correct what he considers misinterpretations of his original statements regarding *Herpetomonas muscae domesticae* made in 1904. When describing the organism as biflagellate, he had intended to convey that the greater number of the vegetative, large forms possessed two thick rhizoplasts, and two flagella. In division near the two original mother-rhizoplasts two daughter-rhizoplasts grew and from these the two long daughter flagella. Daughter products could be (1) forms with one long and one short flagellum, (2) forms with equal flagella, (3) uniflagellate forms that would acquire a second flagellum later on. Wenyon considers the uniflagellate form as the type, and what Prowazek considers a two-division stage, to Wenyon would be a four-division stage. By statistical methods Prowazek has found that the greater number of flagellates examined in Rovigno are biflagellate. Small, uniflagellate forms, he considers, are about to encyst, and from his statistics believes the biflagellate form to be the type. That the two workers were dealing with the same organism seems to be accepted by them as apparently they have interchanged preparations.

A. P.

O'Farrell (W. R.). **Preliminary Note on a New Flagellate *Crithidia hyalommae*, sp. nov., found in the Tick *Hyalomma aegyptium* (Linnaeus, 1758).**—*Jl. Trop. Med. & Hyg.* 1913. Aug. 15. Vol. 16. No. 16. pp. 245-246. With 8 text-figs.

Crithidia hyalommae n. sp. occurs in the common cattle tick of the Anglo-Egyptian Sudan, *Hyalomma aegyptium*. The

present note deals with the flagellate stage of the organism, which, together with pre-flagellate and post-flagellate stages, is found in the coelomic fluid of the tick. The flagellates are long and slender, the total length varying from 26 μ to 48 μ, the flagellum being about 12·5 μ. The average breadth is 2·5 μ. The posterior end tapers to a point. There is a well marked undulating membrane. The nucleus is roundish or oval; in quiescent stages a well defined central karyosome is present, but when active division or cyst formation is about to occur, the nucleus becomes granular. The blepharoplast is usually on the flagellar side of the nucleus. Division is initiated by that of the blepharoplast, one of the daughter blepharoplasts moving to the aflagellar aspect of the nucleus, which thus lies between the two blepharoplasts. The flagellum arises near the blepharoplast but is not connected with it.

The organism usually moves with the flagellar end forwardly directed, but in turning movements and for short distances the aflagellar end can be forwardly directed. The mechanism of movement is briefly described.

Five figures of the ordinary form and three of the dividing flagellate are given. The full paper will be awaited with interest.

A. P.

Franchini (G.). **Nuovo Contributo allo Studio dell'** *Haemocystozoon brasiliense.*—*Ann. di Med. Navale. e Colon.* 1913. May-June. Anno 19. Vol. 1. No. 5/6. pp. 477-480. With 5 text-figs.

The present paper of Franchini covers practically the same ground as his paper published in the *Bulletin de la Société de Pathologie Exotique* of May, 1913, which has already been reviewed with illustrations. [See this *Bulletin*, Vol. 2, pp. 265-266.] All his previous findings are confirmed and he emphasises that further search has revealed no form of leishmania, either free or enclosed in leucocytes, and because of its different development from herpetomonad parasites, as it encysts in the peripheral blood, he retains the name *Haemocystozoon brasiliense.*

A. P.

Moldovan (J.). **Beitrag zur Entwickelung des** *Leucocytozoon Ziemanni* **(Laveran).** [Development of *L. Ziemanni.*]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1913. Sept. 27. Vol. 71. No. 1. pp. 66-69.

The author describes the schizonts of *Leucocytozoon ziemanni* in two screechowls. The infection with the protozoon was spontaneous. Typical gametes occurred in the blood. Smears of the lungs, heart, brain, liver, kidney and bone marrow contained endocellular schizonts of various sizes and in different stages of nuclear division, as many as 30 nuclei being found. The spleen was not examined. The young schizonts show a central nucleus with peripheral chromatin masses, the cytoplasm being alveolar. With growth and nuclear division large ovoid schizonts

are produced, with as many as 30 tiny nuclei. Following the nuclear divisions, the cytoplasm commences to segregate around the nuclei, and these become separated into groups and then probably into uninucleate forms giving rise to merozoites. The last two stages have, however, not been observed. The author notes the resemblance of his schizonts to those described by Fantham for *Leucocytozoön lovati* but considers there are some differences. [Full merozoite formation and liberation has been observed in *L. lovati*.]

The author describes also the young gametes, which are of the usual type. The figures show six successive stages in the growth and nuclear multiplication of the schizont.

A. P.

Phisalix (Marie). **Essai d'Infection sur la Vipère aspic et les Couleuvres Tropidonotes avec** *Haemogregarina roulei.—Compt. Rend. Soc. Biol.* 1913. July 25. Vol. 75. No. 27. pp. 110-111.

Hitherto it has been considered that Haemogregarine infections are not transmissible by inoculation. Mme. Phisalix has tried to transmit *Haemogregarina roulei*, parasitic in *Lachesis alternatus*, to other snakes, using *Vipera aspis*, *Tropidonotus natrix* and *T. viperinus*, known to be uninfected.

1·5 cc. of liver pulp or blood of *Lachesis alternatus*, containing both free and endoglobular forms of the haemogregarine, were deposited direct on the pulmonary epithelium or the gastric mucosa of the snakes. The liquid was passed into the trachea drop by drop from a syringe with a soft canula, and a similar process was used in depositing the liquid on the gastric mucosa. Sixteen snakes, in four groups of two adders and two vipers each, were thus inoculated; eight with liver pulp, eight with blood. In one only, a viper that received 1·55 cc. of blood in its lung and that died 25 hours after inoculation, were haemogregarines found, these being represented by a few free and endoglobular forms in the heart blood. The lung still contained a little of the injected blood with living parasites in it. In Lachesis the free haemogregarines were about five to every hundred erythrocytes, and therefore would be very scarce in the blood of the inoculated snake, but no multiplication in the blood seemed to have occurred. New infection is thought to depend on the receptivity of the subject, rather than on the nature of the haemogregarine introduced.

A. P.

Phisalix (Mme.). **Formes de Multiplication d'***Haemogregarina roulei* **chez** *Lachesis alternatus.—Compt. Rend. Soc. Biol.* 1913. Aug. 7. Vol. 75. No. 28. pp. 194-196.

Mme. Phisalix has found two forms of cysts of *Haemogregarina roulei* in the liver, lung, spleen and kidney of the viper, *Lachesis alternatus*, the free and endoglobular forms of the parasite having been described in a previous paper. (See this *Bulletin*, Vol. 2, p. 263.)

Cysts with macromerozoites were found in smears of the above organs and sections of the same showed them localised in capillaries. The cysts are regular, elliptical, thick walled, containing one to six nuclei according to the stage of division. They may reach 35 μ long and 25 μ wide. These merozoites measure 15 μ to 16 μ long like the young adult forms.

Cysts containing micromerozoites co-exist with those producing macromerozoites. They can reach 45 μ long and 30 μ broad, are always ovoid, are thin walled, and ultimately contain numerous nuclei. Protoplasm condenses around each nucleus and a large number of small, curved merozoites, 7 μ to 7·5 μ long by 3 μ broad, are set free into the blood stream, where they invade the erythrocytes and develop into adult Haemogregarines.

A. P.

Nicolle (Ch.) & Conor (Marthe). **La Toxoplasmose du Gondi. Maladie Naturelle, Maladie Expérimentale.**—*Arch. Inst. Pasteur Tunis.* 1913. No. 1-2. pp. 106-115.

The authors describe first the natural and then the artificial infection of the gondi with toxoplasma. (See this *Bulletin*, Vol. 2, pp. 52-54 and 259-263.) The natural infections were obtained in South Tunisia, whence the disease was first reported. Two kinds of ectoparasites occurred on these naturally infected gondi, an undetermined Ixodus and the larva of a Trombidium. During the first two months half the animals perished, but no toxoplasma were found. Mortality ceased in July, and recommenced at the end of September. From then to January nine animals died, eight with toxoplasma. No special symptom appeared prior to death. In smears toxoplasma were abundant, the spleen containing enormous numbers, the liver and lungs being heavily infected, the blood and bone marrow with few parasites. Polymorphism occurs. Longitudinal division is the only means of multiplication observed. Masses of parasites have been seen but are not considered as identical with the cysts of Splendore, no anterior stages having been seen.

Two cases of experimental infection with bone marrow are described. Incubation takes from eight to nine days. The spleen contains huge numbers of parasites; pseudocysts may be present. Liver and lungs have numerous parasites; kidneys, fairly numerous; peritoneal fluid, very numerous.

Mice are very sensitive to *Toxoplasma gondii*, the parasites being most numerous in the peritoneal fluid and rare elsewhere. Intramuscular injection was used. Guinea-pigs and pigeons also can be infected. Ten white rats, a very young dog, two Macacus, two toads and two frogs were refractory.

Protocols of the various animals investigated are given in detail.

A. P.

Fantham (H. B.). *Sarcocystis colii* n. sp., a Sarcosporidian occurring in the red-faced African Mouse Bird, *Colius Erythromelon*. —*Proceedings Cambridge Philosoph. Soc.* 1913. July. Vol. 17. Pt. 3. pp. 221-224. With 1 plate.

The paper contains an account of a new species of Sarcosporidia, *Sarcocystis colii*, occurring in the red-faced African mouse bird. This bird is considered by Kaffirs as good eating, and it is possible that the parasites thus reach man. The Sarcosporidian trophozoites (Miescher's tubes) are distributed throughout the skeletal musculature, the large breast muscles being the most heavily parasitised part. They occur in the heart muscle, and scattered in the pericardium, peritoneum and intestinal mesentery. Large Miescher's tubes are 2·5 mm. long and nearly 1 mm. broad. Tubes in the cardiac muscle are smaller than those in the general musculature. The spores (Rainey's corpuscles) are not so large as those of some other Sarcosporidia, being only about 7 μ long. They exhibit polymorphism, two main types being distinguished, namely, narrow, sickle-shaped bodies with more deeply staining contents, and broader spores with paler contents, which sometimes are seen in process of division. The nucleus shows cyclical structure, sometimes appearing as vesicular with a karyosome, at other times the chromatin showing as evenly distributed granules. The nucleus is usually near the blunter end, and a polar vesicle is often seen near the more pointed end. The spores show no marked metachromatic granules. Portions of probable polar filaments have been seen in a few well-stained specimens. The characters of the new species, *S. colii*, are polymorphism and somewhat small size of the spores, the apparent lack of marked metachromatic granules and the presence of a definite polar vesicle. The paper is illustrated with a photograph of the dorsal aspect of *Colius erythromelon*, approximately natural size, showing the distribution of the Miescher's tubes.

A. P.

Knowles (R.) & Acton (Hugh W.). **A Note on Kurloff Bodies.** —*Indian Jl. Med. Research.* 1913. July. Vol. 1. No. 1. pp. 206-211. With 2 plates.

The paper first gives a brief summary of the current opinions as well as past ideas regarding the nature of the Kurloff bodies found in the blood of guinea-pigs. Thirteen out of eighteen healthy adult guinea-pigs contained Kurloff bodies, and four out of six young ones. Forty films from a guinea-pig showing numerous Kurloff bodies were made at the same sitting and batches of eight films each were:—" (1) allowed to dry in air and then fixed with methyl alcohol; (2) fixed whilst wet in methyl alcohol; (3) fixed while wet with formol-alcohol (formalin 1: absolute alcohol 9); (4) fixed whilst wet with Schaudinn's granule fixative (saturated aqueous perchloride 60 cc., absolute alcohol 30 cc., glacial acetic acid 3 cc.); (5) fixed whilst wet by immediately plunging them into Schaudinn's fixative, kept at 60° C. on a water bath (saturated solution of perchloride in saline 2 parts: absolute alcohol, 1 part)." Of each group, two films were

stained by Leishman, two by Giemsa, two by original Romanowsky, two by Mallory's iron-haematoxylin counterstained eosin. The result showed that the appearance of Kurloff bodies in fixed films depends almost entirely on the fixative.

The Kurloff bodies were also examined by the jelly method by dark ground illumination and by the dahlia solution method.

The authors' conclusions are as follows:—

"(1) No reliance can be placed upon the appearance of the Kurloff bodies as seen in fixed films, unless the action of the fixative fluids has been previously investigated in order to see what fixation images are obtained. Otherwise the different fixation images obtained may be readily mistaken for stages in a cycle of development.

"(2) In Kurloff bodies stained by a dahlia solution and examined on a warm stage we have been unable to trace any cycle of development.

"(3) It seems somewhat unlikely—though not impossible—that a structure seen in the blood of 71 per cent. of apparently perfectly healthy guinea-pigs is parasitic in origin.

"(4) We adhere to the view that they are cell inclusions of a non-parasitic nature.

"(5) We believe that the Kurloff body is a vesicular structure, and probably of cytoplasmic origin. The guinea-pig is an animal in which these cytoplasmic structures are particularly well developed, *e.g.*, the large archoplasmic vesicles in the testicular cells.

"(6) In the course of repeated examinations of the blood of pigeons in connection with a study of the Halteridium parasite we have occasionally seen somewhat similar bodies in the large mononuclear leucocytes and we doubt if the Kurloff body is specific to the guinea-pig."

A. P.

da Rocha-Lima (H.). **Zur Demonstration über Chlamydozoen.**—*Verhandlungen der Deutschen Pathologischen Gesellschaft.* 1913. pp. 198-210. With 10 text-figs.

The paper contains an account of the Chlamydozoa in relation to disease. The author states care must be taken to differentiate between Chlamydozoa and structures having a similarity to them. By histological methods the Chlamydozoa-inclusions appear granular, like microsomes. They are not artefacts produced by the fixatives employed, since they can be seen in the fresh state, *e.g.* in *Molluscum contagiosum*. In other cases they are more difficult of observation. The elementary bodies occur in the virulent filtrate after use of a bacteriological filter, but are lacking in the non-virulent filtrate from a colloid filter. The elementary bodies thus appear as the excitants of disease. Another hypothesis considers them as degeneration or reaction products of the cell. This idea also is discussed.

The initial bodies that give rise to the elementary bodies in variola-vaccine form a plastin-like coat for themselves. The initial body (Guarnieri corpuscle or body) usually appears homogenous.

The role of Chlamydozoa in various forms of cancer is discussed in some detail, and the author pleads for fuller investigations of the organisms, of which he could only give a brief outline. Ten figures illustrate the appearance of various Chlamydozoa within their host cells.

A. P.

Breinl (Anton). **Protozoa encountered in the Blood of Native Australian Animals.**—*Australian Institute of Trop. Med. Report for the Year* 1911. pp. 30-38.

The report contains notes on trypanosomes, plasmodia, proteosoma, haemogregarines and Haemoproteus from native Australian animals.

Trypanosomes.—*Trypanosoma lewisi* was present in 15 per cent. of the rats. *T. majus* occurred in the white headed sea eagle, *Haliastur girrenera*, and *T. avium* in *Falco hypoleucus*, in whose heart blood rosettes of spindle shaped parasites, suggesting cultural forms, were found. Bower birds, *Chlamydodera orientalis*, harbour a new trypanosome, *T. chlamydoderae*. It is dimorphic and differs from *T. avium* in size and in its small nucleus and blepharoplast. *T. notophoyxis*, n. sp. occurs in the blood of the blue crane, *Notophoyx novaehollandiae*. *T. chelodina* occurred in the tortoise, *Chelodina longicollis* and a trypanosome was found in the owl, *Ninox boobook*.

Proteosoma praecox occurred in *Falco hypoleucus*.

Plasmodium pteropi, n. sp. was present in the flying fox, *Pteropus gouldi*.

Haemogregarines are described from *Chelodina longicollis*. They have been found in numbers in the guts of the tick *Aponomma trimaculatum*, infesting *Varanus varius*, parasitised by *H. varanicola*. The snakes, *Dipsadomorphus fuscus* and *Python spilotes* var. *variegatus*, also harbour Haemogregarines. A leucocytozoon was found in the friar bird, *Tropidorhynchus corniculatus*, and also *Haemoproteus danilewski*. *Haemoproteus noctuae* was present in *Ninox boobook*, *H. columbae* in the pigeon, *Ptilopus superbus*, and *H. danilewski* in birds of several species.

A. P.

Leger (Marcel). **Hématozoaires d'Oiseaux de la Corse.**—*Bull. Soc. Path Exot.* 1913. July. Vol. 6. No. 7. pp. 515-523.

The author examined the blood of various birds obtained in the Eastern part of Corsica in the province of Casabianda, and found various trypanosomes, Haemoproteus, Leucocytozoa, and a Microfilaria. Trypanosomes occurred in *Fringilla petronia* and *Caprimulgus europaeus*. The trypanosome from the Fringilla is identified as *T. laverani*, Novy and MacNeal. A new species, *T. thiersi* is created for the trypanosome from the Caprimulgus, mainly on account of its great size, 84·75 μ long, 8·75 μ broad—the largest of the avian trypanosomes.

Haemoproteus was fairly common in the Fringilla and a slight infection occurred in *Corvus corone*.

Leucocytozoa were found in *Fringilla petronia*, *Turtur auritus* and *Corvus corone*. According to Léger, the Leucocytozoon of Fringilla is unlike that of other Fringillidae and he creates a new species, *L. gentili*, for it. The Leucocytozoon of *Turtur auritus* is the same as *L. marchouxi* of *T. humilis*. The Leucocytozoon of *Corvus corone* is made a new species, *L. zuccarelli*, because (1) it presents peculiar, deepstaining granulations, which

suggest but are not, pigment, in overstained Giemsa smears; and (2) the host cell undergoes nuclear karyolysis even though very young parasites may be present.

A. P.

Kérandel (J.). **Trypanosomes et Leucocytozoön observés chez des Oiseaux du Congo.**—*Ann. Inst. Pasteur.* 1913. June 25. Vol. 27. No. 6. pp. 421-439. With 2 plates.

The paper deals with trypanosomes and Leucocytozoa observed in birds killed during the expedition of Lenfant in the regions of Haute-Sangha and Haute-Logone, Congo. The author has created several new species of these genera, holding that the same trypanosome or Leucocytozoon only occurs in one specific host bird or in a host very nearly related thereto.

He gives dimensions and description of the trypanosome of the guinea-fowl, *Numida meleagris*, which is probably the same as that described by Wenyon from *Numida ptilorhyncha*.

The trypanosome from the francolin, *Francolinus bicalcaratus* is described as a new species, *T. francolini*. It is spindle-shaped with vacuolated protoplasm. There is a much folded, undulating membrane. A distance of 18·9 μ intervenes between the nucleus and the blepharoplast.

T. pycnonoti n. sp. from *Pycnonotus tricolor* is a very rare trypanosome. It was examined fresh and in stained preparations. Its total body length is 49·5 μ and breadth 5·4 μ.

T. viduae n. sp. from *Vidua serena* is rare. Three specimens were found in a single smear. Its posterior extremity is drawn out to a fine point. No free part of the flagellum is present.

The trypanosome of *Strix flammea trimaculata* was studied in only one well stained specimen. It resembles *T. avium*.

T. eurystomi n. sp. was found in the roller, *Eurystomus gularis*. It has a thick body and a regularly folded undulating membrane. Three specimens only were seen.

Caprimulgus fossei harbours a large and a smaller trypanosome, described by the author as two new species, *T. caprimulgi majus* and *T. caprimulgi minus*. Detailed dimensions are given. A trypanosome is also described from an unknown bird.

Leucocytozoa were found in most of the birds that also contained trypanosomes. The host cells are considered to be mononuclear leucocytes and erythroblasts. Following the same plan as with trypanosomes, the author creates new species of Leucocytozoa for new hosts. He attaches importance to the degree of deformation produced in the host cell. His Leucocytozoa include:

1. A Leucocytozoön like *L. neavei* from *Numida meleagris*.
2. *L. francolini* n. sp. from *Francolinus bicalcaratus*.
3. A Leucocytozoön from *Strix flammea trimaculata*.
4. *L. caprimulgi* n. sp. from *Caprimulgus fossei*.
5. *L. eurystomi* n. sp. from *Eurystomus gularis*.

Most of the parasites dealt with in the paper are illustrated, one or two figures of each being given.

[Considering that nothing is stated about the mode of transmission of these parasites and that therefore the cycles of the

trypanosomes in the invertebrate hosts are unknown, it does not seem very wise to create new species in several of these cases, especially when small numbers, *e.g.* three individuals, only have been observed.]

A. P.

von Prowazek (S.). **Zur Parasitologie von Westafrika.**— *Centralbl. f. Bakt.* 1. Abt., Orig. 1913. July 29. Vol. 70. No. 1/2. pp. 32-36. With 1 coloured plate.

The author has received blood smears from animals killed by the expedition to Lake Chad, on which further papers are promised. The present paper deals with (i) the structures known as Todd's bodies from the blood of a chameleon. A full account of previous work on the subject is given. The structures were found always associated with other signs of degeneration in the blood. Prowazek describes their appearance and concludes that they are not parasitic since no differentiation between chromatin and cytoplasm can be discerned, nor is there evidence of multiplication. Eight figures are given.

ii. In the erythrocytes of the yellow mouse he has found bodies which he considers allied to the Grahamella of the mole. Two figures are given.

iii. Certain smears from various antelopes and gazelles showed gut as well as blood parasites—probably the result of gunshot contamination. Among these is an organism somewhat like *Spirillum sputigenum*, for which Prowazek suggests the name *Selenomonas*. The organism is bowed or sausage shaped, and from its inner concavity a number of united cilia or flagella form a pseudo-membrane. The protoplasm contains alveoli. The outer membrane can become thickened and cyst-like, when the ciliated membrane contracts and resting stages are produced. Nine figures of *Selenomonas* are given.

A. P.

Alexeieff (A.). **Introduction à la Révision de la Famille *Herpetomonadidae* (= *Trypanosomidae* Doflein 1911).** — *Arch. f. Protistenkunde.* 1913. May 27. Vol. 29. No. 3. pp. 313-341. With 3 text-figs.

The present paper continues the ideas set forth in two previous ones (Reviewed in this *Bulletin*, Vol. 1, pp. 158 & 496). Alexeieff revises the *Herpetomonadidae*, preferring this name to *Trypanosomidae* of Doflein, Herpetomonas being a more primitive type of flagellate than Trypanosoma. The Herpetomonadidae include three genera only, *Herpetomonas*, *Crithidia*, and *Trypanosoma*. Each genus is defined and discussed. As before, the author protests against the idea of absolute specificity of parasites to the one host, and insists that the sole criterion should be the morphological one. The existence of erratic parasites on the one hand, and the great plasticity of living organisms on the other both need full consideration.

The genus Herpetomonas is considered to have three good species. I. *H. muscae domesticae* (= *Leptomonas drosophilae*,

= *L. pycnosomae*, = *L. muscae domesticae*, = *H. calliphorae*, = *L. ampelophilae* = *H. luciliae*). II. *Herpetomonas gracilis* (= *H. sarcophagae*, = *Cercoplasma* (*Leptomonas*) *mirabilis* = *C.* (*L.*) *mesnili*, = *C. caulleryi*). III. *Herpetomonas jaculum* (= *L. jaculum*, = *H. lygaei*, = *L. agilis*, = *L. davidi*).

The genus Crithidia is discussed in some detail, is considered autonomous, and is defined as having the blepharoplast in a juxta-nuclear position in the flagellate form. The author does not think the genus *Rhynchoidomonas* then is necessary, and that forms intermediate to *Crithidia* and *Rhynchoidomonas* will be found.

Trypanosomes are not considered to be specific to one host only. There are more than 40 species of Trypanosomes recorded from mammals alone. The blood of mammals has a constant and uniform constitution, and the contained trypanosomes are practically morphologically identical. Physiological criteria such as inoculability, acquisition of immunity and pathogenic action, all are variable, and thus cannot be used for determining specificity. Many "species" should be more accurately described as "races" of a species.

The discussion of heterogamy and autogamy leads to the conclusion that nothing positive is known of sexuality in the Herpetomonadidae, but sexual processes may be replaced by some caryocytoplasmic relationship.

A. P.

Poche (Franz). **Das System der Protozoa.** — *Arch. f. Protistenkunde.* 1913. Sept. 12. Vol. 30. No. 3. pp. 125-321. With 1 text-fig.

The classification of the Protozoa is set forth by Poche in 196 pages of text. The phylum Protozoa is subdivided into a complicated and somewhat confusing series of superclasses, classes, under classes, orders, supersuborders, suborders, supertribes, tribes, subtribes, families and subfamilies. More than 200 new names distributed between the above subdivisions appear. Unfortunately the characteristics of the various members as above indicated are often not clearly defined, and though consistency in classification is aimed at, yet gaps occur as can only be expected. Uniformity in the terminology used in classification appears to be the ideal of the author, but the rather inelastic system proposed by him does not admit of progress of knowledge regarding many organisms, and it is easy to see that confusion would be bound to occur when organisms considered first as "families" were, perhaps, found to be "genera" of some other "family" or "order," or when the elevation of a "tribe" to an "order" became necessary with increased knowledge.

The paper does not appear to be of much interest to the practical worker in the tropics.

A. P.

Reviews.

Mense (Carl). **Handbuch der Tropenkrankheiten. Zweite Auflage. Band I. Die Krankheitserreger und Krankheitsüberträger unter den Arthropoden.** [Disease-Producing and Disease-Carrying Arthropods.] Von Dr. Adolf Eysell, R. Doerr und V. Russ.—xv + 295 pp. With 200 text-figs., 10 black and white and 2 coloured plates. 1913. Leipzig: Verlag von J. A. Barth. [Paper cover, 16.20 Mk.: bound, 18 Mk.]

This book gives a plain unvarnished account—not quite up to date, perhaps, in some particulars—of all the Arthropoda that are of acknowledged importance in human pathology—both those that are constantly concerned in the transport of pathogenic organisms, and those less direful forms that are only occasionally noxious as temporary parasites or as inflicting irritating or venomous wounds.

The disease-carriers included are—besides *Cyclops*, which is disposed of in a few lines and a figure—ticks, lice, bugs, fleas, mosquitoes and other midges, gadflies, Muscidae, and tick-flies; every group being separately considered in its general characters, anatomy, mode of life, habits, classification, methods of preservation, and prophylaxis. Natural enemies are sedulously enumerated in every case; but the author does not consider the broad question whether they are to be accepted as of supreme use to the sanitarian under *all* circumstances, as some are inclined to imagine, or whether—as seems more reasonable to suppose—they are to be regarded merely as humble auxiliaries in places where they themselves are protected and assisted by those artificial conditions which the sanitarian maintains in opposition to the scheme of nature. To every group, too, an extensive bibliography is appended, which will be of the greatest service to medical men who have to grapple with the sanitary problems of tropical countries.

Though the *Culicidae* occupy nearly one-third of the volume, not everything that might with advantage be said about them is included. Their structure and life-history, their method of feeding, the mechanism of the emergence of the imago from the pupal skin, and the best ways of collecting and preserving them are described very fully, while their bibliography runs to 38½ pages. But, on the other hand, not very much is said about approved methods of destroying larvae, and all Culicidae except the Anophelines are deliberately ignored—a few lines and a couple of figures being all that is accorded even to *Stegomyia;* here the author carries to an unreasonable extreme his opinion that the medical man should be content with a limited knowledge of the group, and perhaps hardly justifies his exhaustive bibliography.

One may sympathise with the author's impatience of cabinet-entomologists whose "genera" and "subfamilies" of Culicidae sometimes dissociate—what no man should sunder—the male and female of the same species, and whose "Anopheline genera" sometimes merely magnify individual or seasonal variations; and many will join with him in qualifying with inverted commas divisions so arbitrary and unnatural. But it is hardly satisfactory to find all the species of *Anopheles* left on the cabinet-entomologist's shelf, on the ground that *all*—whatever for the moment be the verdict of the laboratory—may possibly, in some still undetermined circumstances, harbour malarial parasites.

The author tabulates the differences between *Anopheles* and all other Culicidae very clearly, but whether these differences justify the isolation of the former in a separate family, *Anophelidae*, is a very doubtful question. This exaggeration of differences, in disregard of obvious fundamental resemblances, is the very fault that the author condemns with so much justice in the troublesome *Fachentomolog:* a natural classification must take likenesses into account equally with unlikenesses, and must represent the sum of both. The author, probably, would be the first to admit that it is not a matter of indifference, from a practical standpoint, whether a classification be natural or arbitrary; for, as Huxley insisted, a natural classification is of perennial importance since it represents a series of accurate generalisations regarding structure.

In the section on the *Muscidae*, the common house-fly hardly receives the attention it deserves; there may be a tendency in some quarters to aggrandize the pathogenic importance of this insect, but every medical man in the tropics ought to know all that is to be known about it.

The systematic account of *Glossina* does not go beyond Austen's "Monograph" of 1903; the relation of *G. morsitans* to human trypanosomiasis is not referred to; and though animals that might prove to be natural enemies of tsetse-flies are enumerated, the far more important subject of animals that may assist tsetse-flies in their evil work—and how these are to be regarded by the sanitarian—is not discussed.

Of other blood-sucking Muscids *Stomoxys calcitrans* is the only species that receives much attention. *Beccarimyia* makes an unfortunate reappearance, and *Glosinella* again emerges from oblivion.

The Arthropoda that are occasionally and individually noxious naturally occupy only a small part of the book. They include Linguatulida, Mites, the larvae of bot-flies, and the larvae of those several families of *Muscidae* that make up the tale of myiasis; all these are considered in detail. Spiders, Scorpions, Centipedes, Aculeate Hymenoptera, certain beetles, and certain Lepidopterous larvae are also briefly dealt with, chiefly in respect of the injuries they inflict.

An appendix on the genus *Phlebotomus* is contributed by Doerr and Russ; it gives all that is known about the structure, development, habits, life-history etc. of these midges, and all the species, except those quite recently described, are mentioned.

On the whole the volume can be recommended to medical men employed in the tropics as a most laborious and methodical epitome of the Arthropoda that immediately concern them; while to those who have to take up any specific investigation, the bibliographical sections, apart from anything else, will be of signal service.

A. Alcock.

Prout (W. T.). **Lessons on Elementary Hygiene and Sanitation, with Special Reference to the Tropics.**—xx. + 184 pp. Illustrated. 1913. London: J. & A. Churchill. [2*s.* 6*d.* net.]

The "lessons" have now reached a third edition, this testifying to their popularity and general use. Before their first publication there was a special want for a book of the kind and it must be gratifying to the author to find that his work has so successfully filled this void. There is no question of the value of such instruction in schools and amongst the general laity in the Tropics. It is by means such as these that the coming generations will enjoy improved health and all the benefits and advantages that such a state of affairs implies. Dr. Prout's little book is an excellent one.

G. C. L.

LIST OF REFERENCES.

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[Continued from BULLETIN, Vol. 2, No. 5, pp. i–xxxiii.]

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Amoebiasis (including Amoebic Dysentery and Liver Abscess).

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